

# POPULAR **Computing** WEEKLY



3 June 1982 Vol 1 No 7

**30p**

**The Black Hole**

**Reviewed inside:  
Jungle Maths**

**Party Tricks**

**40 column board  
for Vic-20**

**ZX81 character  
codes**

**Spectrum colour**

# ANGLO AMERICAN SOFTWARE CO.

## SOFTWARE SPECIALISTS

Starfleet Orion	PET 8K TRS-80 Level II 16K TRS-80 32K w/disk	£19.50
Invasion Orion	APPLE Integer BASIC 16K APPLE Integer BASIC w/disk 48K TRS-80 Level II 16K — ATARI 32K TRS-80 32K — APPLE 48K w/disk	£19.50
Temple of Apshai	ATARI 32K w/disk TRS-80 Level II 16K TRS-80 32K — APPLE 48K w/disk ATARI 32K	£23.50
Hellfire Warrior	ATARI 32K w/disk IBM 64K w/disk TRS-80 Level II 16K	£23.50
Upper Reaches of Apshai	TRS-80 32K — APPLE 48K w/disk	
The Keys of Acheron	TRS-80 Level II 16K TRS-80 32K — APPLE 48K w/disk	£15.50
Curse of Ra	TRS-80 Level II 16K TRS-80 32K — APPLE 48K w/disk TRS-80 Level II 16K	£15.50
Introductory 3-Pack	24K PET w/disk TRS-80 32K	£32.00
3-Pack: Morloc's Tower, Rescue at Rigel and Datesones of Ryn	APPLE 48K w/disk	
Datesones of Ryn	TRS-80 Level II 16K — ATARI 32K TRS-80 32K — APPLE 48K w/disk ATARI 32K 2/disk	£15.50
Morloc's Tower	PET 24K TRS-80 Level II 16K	£15.50
Dragon's Eye	TRS-80 32K — APPLE 48K w/disk APPLE 32K	£19.50
Sorcerer of Siva	32K PET APPLE 48K w/disk	£21.50
Rescue at Rigel	TRS-80 Level II 16K TRS-80 32K — APPLE 48K w/disk ATARI 32K w/disk	£21.50
Star Warrior	TRS-80 Level II 16K — ATARI 32K TRS-80 32K — APPLE 48K w/disk ATARI 32K w/disk	£23.50
Crush, Crumble and Chomp!	TRS-80 Level II 16K — ATARI 32K TRS-80 32K — APPLE 48K w/disk ATARI 32K w/disk	£21.50
Tuesday Morning Quarterback	TRS-80 48K — APPLE 48K w/disk ATARI 16K — TRS-80 Level II 16K	£21.50
Richochet	TRS-80 32K — APPLE 48K w/disk ATARI 32K w/disk	£19.95
Jabbertalky	TRS-80 32K — APPLE 48K w/disk IBM 64K w/disk	£21.50

SEND 75p FOR FULL CATALOGUE  
(Refundable against purchase)  
DEALER ENQUIRIES WELCOME

**ANGLO AMERICAN SOFTWARE**

138a Stratford Road, Sparkhill  
Birmingham B11 1AG 021-771 2996/2736

ALL PRICES INCLUDE VAT & POSTAGE  
24 Hour answering service  
on 021-771 2995 for Access orders.



PLEASE SUPPLY \_\_\_\_\_

I enclose a cheque/PO for £ \_\_\_\_\_ made payable to  
ANGLO AMERICAN or debit my \_\_\_\_\_

Access and number \_\_\_\_\_

Signature \_\_\_\_\_

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

# POPULAR Computing WEEKLY

## The Team

### Editor

Duncan Scot

### Reporter

David Kelly [01-930 3271]

### Sub-editor

Peter Harvey

### Designer

Eric Robbie

### Editorial Secretary

Fiona McCormick

### Advertisement Manager

David Lake [01-839 2846]

### Advertisement Executive

Alastair Macintosh [01-930 3840]

### Publishing Director

Nick Hampshire

Popular Computing Weekly,  
Hobhouse Court, 19 Whitcomb Street,  
London WC2  
Telephone: 01-839 8835

Published by Sunshine Publications Ltd.

Typesetting, origination and printing by  
Chesham Press, Chesham, Bucks

Distributed by S M Distribution  
London SW9. 01-274 8511. Telex: 261643

© Sunshine Publications Ltd 1982

### Subscriptions

You can have Popular Computing Weekly sent to your home: the subscription rate is £19.95 per year, for addresses in the UK.

### How to submit articles

Articles which are submitted for publication should not be more than 1000 words long.

All submissions should be typed and a double space should be left between each line.

Programs should, wherever possible, be computer printed.

At present we cannot guarantee to return every submitted article, so please keep a copy.

### Accuracy

Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, though we will always try our best to make sure programs work.

## This Week



Cover illustration by Ian Craig

<b>News</b>	<b>5</b>
Clash on Spectrum name, EEC backs tele-text.	
<b>Club Reports</b>	<b>7</b>
David Kelly reports on the Sunbury-on-Thames computer club.	
<b>Black Hole</b>	<b>8</b>
Dave Middleton presents a space game for the ZX81.	
<b>Reviews</b>	<b>10</b>
Missile Command, ZX81 EPROM.	
<b>Open Forum</b>	<b>13</b>
Seven pages of programs.	
<b>Programming</b>	<b>20</b>
ZX81 character codes.	
<b>Spectrum</b>	<b>22</b>
Nick Hampshire looks at Spectrum colour.	
<b>Sound &amp; Vision</b>	<b>23</b>
About computer art and music.	
<b>Peek &amp; Poke</b>	<b>25</b>
Your questions answered.	
<b>Competitions</b>	<b>26</b>
Puzzle, crossword.	

## Editorial

Most schools in the country must know by now about the various Government microcomputer support schemes.

The most ambitious of the Government's aims is to see a microcomputer installed in every secondary school by the end of this year.

To this end it has been offering to pay half the cost of each computer bought. But most of the computers approved under the scheme are expensive and, by now, largely obsolete.

The other half of the Government's campaign is Information Technology Year '82, a project supposed to stimulate public awareness. But ITY seems to have died of inertia less than half-way through.

Many teachers must have realised by now that if they want to equip their pupils for a computing future they will have to do it on their own initiative.

The only way to keep up is to go out and buy a computer now. Schools cannot afford to wait for the Government and local education authorities to catch up.

## Next Week



It's a drab, drab world till you add a little colour with your BBC Micro. Paint the town red, blue, yellow... the choice is yours!

# Classified

## 20 SIMPLE ELECTRONIC PROJECTS FOR THE ZX81 and other computers

Make the most of your Micro-computer with this great book of construction projects, £6.45.

Available from:  
National ZX Users' Club  
44-46 Earle Court Road  
London W8 6EJ

Please make your cheque payable to Interface.

**ZX81 WITH 16K RAM** for sale. All original packing, £75. Tel: 01-642 9190 days, 01-771 6814 evenings (Croydon).

**ZX81 WITH 16K** plus two tapes, only £75. Tel: Burgh Heath 57666.

**VIC-20**, cassette deck, super expander, super loader ROM software worth £16, only £235 unboxed. Tel: 993 2778, 6-8 pm.

**CBM 32K 4008** and cassette sound-box, books, much software, £499 one (neg). Tel: 051-628 1500 (Liverpool).

**VIC-20** and VIC cassette plus £16 books, cost £270. Best offer secure. Tel: 081 01-734 4436.

**SHARP PC1211 POCKET COMPUTER** plus printer and cassette interface with manuals, £80. Tel: 041-894 3404.

**ZX81 EDUCATIONAL SOFTWARE.** Brush up on your "O" level maths and French. Three (16K) programs of generated maths questions plus answers plus help. Three (16K) programs of French grammar (plus tests) plus three (16K) programs of vocabulary. Both cassettes £4.50 each or send for catalogue to: Rose Cassettes, 148 Widney Lane, Solihull, West Midlands B91 3JH.

**ZX81 PLUS 64K MEMOTECH RAM** plus tapes. Guarantee, £95. Tel: 01-455 6296.

**VIC-20 COMPUTER**, cassette deck, programmers guide, Introduction Basic (1), joystick software, £200. Tel: 01-969 6374.

**ZX81**, vgc, 16K, user port, tapes, Chess Defender etc. Only £100. Tel: 0630 85555.

**ATOM USERS** interesting new range of hardware for the Atom Atom, please send for full details. Poundgate E.D.S., Beguildy, Kington, Powys. Tel: 06477 273.

**ZX81 16K**, excellent condition, 5 months old, leads, tapes, manual and books £100. Tel: Carlisle 60842 after 5 pm.

**ZX81 16K VIC** 3 months old and 2 tapes £100. Phone Worthing 46344.

**BBC MICRO**, VIC Invaders + Break-out and Dodgems. All new on model A or B using sound and colour. Three programs on one cassette £4 inclusive. From B. Cridland, 8 Bonness Avenue, Fleetwood, Lancs FY7 6PA.

**ZX81 WITH 16K RAM**, as new, plus four Sinclair tapes. Phone Davies 0453 60304 daytime.

**FOR SALE**, 4K ROM ZX80. First offer over £30 secure, including leads. P. Gower, 4 Clifford Crescent, Newport Gwent.

**ZX81 16K RAM** with all leads etc, cost £120 will accept £85. Phone 061-431 3800 evenings.

**ZX81 16K PROGRAMS**, 2 tapes, 4 cassettes, £1. £3.75 each, SAE details, M. Fox, 6 Lawson Close, Aldridge, Walsall W50 0FX.

**ZX81 16K PAYE TAX PROGRAM** based on "Which" Tax Guide. Check last years tax, estimate this years tax and code; check salary tax, N.I., and superannuation deductions. Updatable at next budget. Extensive notes. Dr Wilkinson, 57 Osbedwick Village, York YO3 3NP. £5.95.

**ZX81 BLEEP**. Provides audible feedback. Improves your keyboard cheaply, fits inside. Simple plug-in, no soldering connections. Aids faster more accurate programming. £5.95 includes instructions. P&P+VAT, Fulcrum Products, Dept. W, Hillside, Steep Lane, Findon, W. Sussex.

**ZX81 16K COMPUTER**, five months old, large collection of books and cassettes, £90. Tel: 024-369 4207 evenings.

**VIC-20** for £150 including presentation cassette and booklet and lots more, 67 Worcester Street, Oldham, Lancs OL9 7SE.

**M246K 48K**, extended Basic, £335. Some software available. Tel: 01-555 4470 evenings.

**ZX81 16K** plus many program cassettes, chess, finance, adventures, console, £130. Tel: 021-533 6734.

**ACORN ATOM**, 12K+12K. Colour monitor, cassette, £350 one. Tel: 0203-465311 ask for H217 (evenings only).

**SINCLAIR ZX81** plus 16K RAM, vgc, five months old, £80 one. Tel: Hastings 753873 after 5 pm.

**ACORN ATOM**, 8K ROM plus 12K RAM. Hardly used, superb condition. PSU, leads, etc. £190 one. Tel: Wington (STD 0934) 862231.

**VIC-20**. Six months guarantee left, £140 one. White, Hillside, Tottenham Lane, Weston-super-Mare.

**ZX81 16K**. Complete, six months old. Tel: Kingston 34 May 849.

**ZX81 16K** plus seven software cassettes including chess, £75. Tel: 01-524 4366.

**BBC COMPATIBLE COMPUTER** to cassette leads. Type (1) two 3.5mm plugs and one 2.5mm plug. Type (2) 5-pin DIN, £4.50 each. — Electronics Applied, 4 Dromore Road, Carrickfergus, Co Antrim, BT38 7PJ.

**ZX80 16K RAM**, 8 K ROM, constant display, proper keyboard, cased, books, tapes including defender and ZXAS assembler, £100. Luton 411340.

**VIDEO GENIE COMPUTER**, 3 months old, and programs, £190. 0272-653300 (Bristol).

**ZX81** Two 16K games (cassette), excellent value, guaranteed. Includes "Destroyer", great display! £5.00 (including p&p). P. Carr, "3-5-5", Tunbeck Road, Wortwell, Norfolk.

**ZX81**, 16K factory built, two months old, for sale, £50. Galsband, East Grange, Morpeth, Northumberland. 0670 513337.

**ATARI 400**, cassette, joysticks, manuals, complete, as new, £280. Star Raiders £20.00. Phone 461 1604.

**16K ZX 81** with keyboard, 2 software cassettes and 2 books, £100 one. Ring 0695 31361.

**ZX81 16K** plus push button keyboard, learning lab, Starlink, loading and saving lip, £110.00. Tel: 0933 876495.

**FREE CATALOGUE** of quality ZX81 programs, many available as inexpensive listings. Send large SAE to Aquarius Software, 53 Townsend Crescent, Potts Wood, Kent BR5 1PH.

**SINCLAIR ZX81, 16K RAM**, Abacus controller, 2 books, works perfectly, very good condition, £80 one. Ipswich 713365.

**ZX81 16K** plus d'Kronic Graphic Rom, 4 tapes £100. Tel: 021-745 8471

## CLASSIFIED ADVERTISING RATES:

Line by line: For private individuals, 20p per word, minimum 10 words.

For companies, traders, and all commercial bodies, 40p per word, minimum 20 words.

Semi-display: £10 per single column centimetre, minimum length 3 cm. (Please supply A/W as PMT. Or supply rough setting instructions.)

Conditions: All copy for Classified section must be pre-paid. Cheques and postal orders should arrive at least two weeks before the publication date.

If you wish to discuss your ad, please ring Alastair Macintosh 01-930 3640.

## Here's my classified ad.

(Please write your copy in capital letters on the lines below.)


Please continue on a separate sheet of paper

I make this ..... words, at ..... per word so I owe you £.....

Name .....

Address .....

.....

.....

Telephone .....

Please cut out and send this form to: Classified Department, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2

## Other end of the Spectrum?

Micro APL, which launched its Spectrum microcomputer last September, is concerned about possible confusion between its product and the new Sinclair ZX Spectrum.

Micro APL did not register the name because it was advised that the name was too common to be accepted as a registered trade mark.

Now the company is getting enquiries from customers who are confusing the two machines.

The two Spectrums appear to have little in common. Sinclair's ZX Spectrum is, at £125, the lowest priced colour and sound machine. Micro APL's Spectrum is a 16-bit multi-user multi-task APL machine aimed mainly at the business market, with a basic price of around £10,000.

However, Micro APL is considering ways of clarifying the differences between the two micros. One solution would be to publish advertisements highlighting the facilities of the different Spectrums.

Micro APL emphasises that there are no hard feelings, and is in friendly communication with Sinclair Research.

## EEC looks for new teletext

Interactive full-channel teletext is now a real possibility following EEC funding for a research study group.

Logica Ltd, of London, together with Italian General Systems, has been given £50,000 to look at the possibilities of an interactive teletext system using cable tv. The group will also investigate the problems involved in the development of a full-channel system.

The advent of satellite and cable tv makes possible the use of complete tv channels for teletext, instead of the eight spare lines of tv signal that are currently used.

In this way a much greater volume of information could be transmitted and, with cable tv, a return signal would be possible, enabling interactive teletext.



Visitors check out the prize-winning ZX81 at the Design Council.

## Design Council picks the ZX81 for award

Sinclair's ZX81 is the first micro computer to win a Design Council Award.

Judges for the 1982 awards praised Sinclair for bringing computers within reach of the general public. The panel concluded: "The price and easy-to-follow instructions mean that every member of the family can have the opportunity to learn about computers and how they are programmed."

The award comes as Sinclair Research reports sales of over 200,000 units per week to America.

At the same time an exhibi-

tion of micros and their uses — called 'Inside Information' has been mounted jointly by the Design Council and Information Technology '82. At the Design Centre in London's Haymarket, it features many micros, including the ZX81, BBC Model B and the new Osborne 1. The display concentrates, not only on the hardware, but also on the wide-ranging applications of micros — in the home and at work — and their use in, for example, medicine and telecommunications.

The exhibition runs until June 26 and entry is free.

## Now: the fully equipped remote control household

Stripland Electronic Control Systems have introduced a range of control units enabling micros to program the operation of domestic appliances by remote control.

The system comprises the user's own host-micro, one TX008 interface and up to 32 remote receiver units.

Instead of direct wiring from the TX008 unit to the appliance, which could be a tv, radio, lighting or even motorised curtains, the Stripland

system uses the existing mains lines.

Richard Last, of Stripland, told *Popular Computing Weekly* that he will shortly be selling a two-way version of the system with built-in memory at the remote point. The remote device would then be able to store information and send it back to the micro.

Further details from Stripland, 111 Liverpool Road, Formby, Merseyside L37 6BR.

## Scotland gets first micro show

Edinburgh ZX Computer Club is to hold a one-day show on July 24. More than 30 stands are planned for this, the first micro show of its kind in Scotland.

Organiser Gordon Hewit told *Popular Computing*

*Weekly* that the time was right for such a show.

The ZX fair will be at Meadowbank Stadium, open from 10am to 6pm.

Further details from Gordon Hewit, 3 Baberton Mains View, Edinburgh EH14 3BR.

## Commodore show is on

Britain's only consumer weekly for micro owners, *Popular Computing Weekly* will be at the Cunard Hotel from June 3 to 5 for the 3rd International Commodore Computer Show. With twice the space of last year's show — over 30,000 sq ft on both exhibition levels of the hotel — there will be 154 stands on display.

Displays will feature all the new Commodore products, including the Vic-10, Vic-30 and Commodore 64, plus the Vic networking system from Datalect and IT '82.

The show is to be opened by Commodore International's Chief Executive, Jack Tramiel.

The venue is the Cunard International Hotel, Hammersmith, London. Entry is £1 and the opening times are: June 3, 12am to 6pm; June 4, 10am to 6pm; and June 5, 10am to 5pm.

You can find *Popular Computing Weekly* on Stand 140, on the lower floor.

## IBM can't be too Personal

IBM still has no plans to introduce its Personal Computer to the UK.

The company now has an estimated backlog of 40,000 orders in the US and consequently no spare production to contemplate a UK launch.

Meanwhile, Mick Punter, managing director of Microcomputerland, has been importing the IBM micro.

Microcomputerland gets round IBM's export restrictions through its purchasing links with Computerland, an IBM US distributor.

However, Microcomputerland has reportedly been the subject of Fraud Squad enquiries and apparently a number of 'salesmen' have been fired by Punter.

The IBM Personal Computer System is also being imported by KGB micros.

Contact Microcomputerland, 1 Prince's Street, Richmond, Surrey, or KGB Micros, 14 Windsor Road, Slough SL1 2EJ.

## The ultimate in Useful Sharp MZ80A/ Sharp MZ80K Software by Dale Hubbard

Fed up with boring games? Make your SHARP work for you!  
All program cassettes based and written cleverly in Sharp standard Basic.  
All programs are "menu" operated and complete with demonstration files where appropriate. 48K memory required.  
All prices include VAT and post and packing. Despatch by return.

### DATABASE

The program that everyone needs. Facilities include: add, search, list, delete, change, totals, save file, line print if required, etc. etc. Can be used in place of any card index application. £19.95

### RUBIK SOLVER

It's not our policy to offer games but we make an exception here for a program to solve the cube from ANY position. Short-hand notation makes learning the solution by heart possible for most active brains. £12.95

### DECISION MAKER

A serious program that enables the computer to make a sound decision for you based on various criteria.  
If you want to buy a car, hi-fi, house, etc., or you don't know which woman to marry then you need this one. £5.95

### STOCK CONTROL

All the necessary for keeping a small retail inventory. Routines include stock set-up, value totals, locations, minimum stock levels and many more including financial summary and line printer routines, please state machine type. £19.95

### ACCOUNTS

A gem of a program, all for cassette, with the following features:

- Daily Journal
- Credit Sales
- Cash Sales
- Credit Purchases
- Purchases — other
- Sales Ledger
- Purchase Ledger
- Bank Account
- Year to Date Summary

A fully interactive program suitable for all businesses. Files can be saved and loaded and totals from one file carried forward to another on cassette. Particularly useful from a cash flow point of view, with an immediate accessibility to totals for debtors and creditors. Bank totally supported with entries for cheque numbers, credits and, of course, running balance. £19.95

Access cards accepted. Send cheque or PO or credit card number to:

**GEMINI MARKETING LTD**

Quay House, Quay Road, Newton Abbot, Devon TQ12 2BU.

OR telephone us with your credit card order on Newton Abbot (0626) 62860

Despatch by return

VIC 20 • VIC 20 • VIC 20 • VIC 20 • VIC 20 • VIC 20

## LLAMASOFT SOFTWARE!!

ARCADE QUALITY GAMES FOR THE VIC 20...

### DEFENDER (M/C)

FULL FEATURE VERSION OF THE POPULAR ARCADE GAME, INCLUDING: SWARMERS, BATERS, PODS, LANDERS AND HUMANOIDS. CONTROLS: UP, DOWN, THRUST, REVERSE, FIRE AND SMART BOMB. (8K) HIGH RESOLUTION COLOUR GRAPHICS, JOYSTICK CONTROLS.

**ONLY £10.00**

### BOMB BUENOS AIRES

FLATTEN THE ARGENTINE CAPITAL WITH YOUR VULCAN BOMBER, AND THEN LAND IT IN SAFETY. LEVELS OF PLAY, HIGH RESOLUTION COLOUR GRAPHICS. WILL RUN ON THE UNEXPANDED VIC 20.

**ONLY £4.95**

OR BOTH PROGRAMS ON ONE CASSETTE

**FOR ONLY £12.95**

AVAILABLE FROM: LLAMASOFT SOFTWARE

LINDON HOUSE, THE GREEN, TADLEY

BASINGSTOKE, HANTS

TEL: (07356) 5038

## From Dreams to Reality....

It's here at last!

## B.B.C Microcomputer Games Pack 1

GAMES PACK INCLUDES:  
STAR WARS — BLACKJACK — SIMON —  
FORTUNE — ALIEN INVASION

R.G.B COLOUR MONITORS

£317.50 inc. Lead, V.A.T. and P. & P.

recommended for use with B.B.C Microcomputer

**Now Available B.B.C Microcomputer  
Pack 2 3 Great Games**

Star Trek - Puck Chase - Mastermind  
Both Packs for B.B.C models A and B

**for further information send large S.A.E.**

## Computers for All

72 NORTH STREET, ROMFORD, ESSEX. TEL 0708 752862



# Club Reports

Is your club involved in any special projects? Use this page to tell the world about it.

## Three years on and it's still fun in Sunbury

*David Kelly visits Sunbury-on-Thames Computer Club and talks to its founder*

They're such a casual lot in Sunbury. Not for them the establishment rigours of membership fees, newsletters, and tutorial meetings. Though founder Simon Taylor originally planned that the club should take that sort of direction, the members unanimously decided against such formalities and instead created a regular weekly meet in the pub to offset the 'formality' of their monthly meeting in St Benedict's Church Hall in Ashford.

A lot has happened in the three years since the club was formed and Simon readily points out that it's been a long time in the world of micros.

Nowadays he's making a name for himself as creator of the game *Bitz*, which Commodore have contracted to market, and as a software programmer for Microgen and also writing programs for the new Sharp PC-1500. At 18 he's a budding expert quite naturally at home in one of the oldest computer clubs in Britain.

It all started just after he left school. First he saved for a Mark 14, Sinclair's first micro, and began learning machine code. Then when a friend bought a Nascom I kit he decided to try to get in touch with other micro enthusiasts in and around Sunbury.

As so often happens, it was a letter in a magazine which really set the ball rolling. Simon got 10 letters and promptly organised meetings. He kept a list of names and addresses and every month someone



Simon Taylor... a budding expert

would volunteer their house for the meeting. Everyone brought along their machine and exchanged ideas and programs.

They would meet on the first Friday of the month, bringing quite a variety of micros — Mark 14s, Nascoms, a Trilon, Paycomp '80s, an Eclor Junior and an Aim 65. Most of the machines operated only in machine code and if your micro understood a high-level language then that was really something!

Over the next eight months the club grew rapidly, with new members joining every month.

This arrangement ran into difficulties when more than 50 people, each with their machines turned up to the December 1980 meeting. The problem was no longer how to plug in all the micros but how to get all the members in through the front door! This was to be the last meeting of that type — just meeting in each other's homes was no longer practical.

The three people most involved in the running of the club at this time, Simon Taylor, Andy Lawrie and Stephen Battle, felt the club needed a formal set up — with membership fees, a newsletter and possibly lectures and tutorials.

They set out their ideas in a letter but the response from members suggested the most important feature of the club was its informality. To have a rigidly constituted group would be to destroy what the club stood for — a friendly meeting of people

with a common interest. So it was decided to carry on, but to let the club, as far as possible, govern itself.

Over the next four months they held no meetings at all while Simon searched for a suitable monthly venue. At last he found St Benedict's Church Hall in Ashford and in April 1981 they met again for the first time in the hall.

Since then Sunbury Computer Club has met on the last Tuesday of every month and the air of informality is maintained. Simon keeps no list of names and addresses of those who attend and can only estimate that the membership is stable at somewhere around 60. In his own words "it is just a place where interested individuals can go and talk and exchange ideas."

He reckons that within the membership they now have at least two of every popular computer (except, strangely, the PET), and can provide help and advice on just about any machine.

The club also meets every week in the pub 50 yards from Simon's home — The Grey Horse.

As the club has developed, so has Simon's involvement in micro-computing. Together with Microgen he plans to produce a monthly cassette-based user club magazine, which should appear before the end of the summer.

All this, together with his full-time apprenticeship and his work for Sunbury Computer Club keeps Simon very busy — he admits he doesn't know where he finds the time. Simon's advice is never to forget the Sunbury Club's motto — *Per ardua ad error!*

Sunbury Computer Club meets at 8 pm in St Benedict's Church Hall, Napier Road, Ashford, on the last Tuesday of each month. The next hall meeting will be at 8 pm on June 29. On the other Tuesdays of each month the club meets for a drink and a chat at 8 pm in the Grey Horse, Staines Road East, Sunbury-on-Thames.

Further details from Simon Taylor, 8 Priory Close, Sunbury-on-Thames.

## For your diary

Norwich and District BBC Micro-Computer User Group meets twice-monthly, with workshops and talks, in Norwich City College. Contact Paul Beverley, Room B12a, Norwich City College. (Tel: 0603 60011 ext 233).

Mid-Cheshire Computer Club meets on the second Friday of each month in the main Winsford Library (in the Town Centre Precinct) at 7.30 pm. Contact Dave Clare, Providence House, 222 Townfields Road, Winsford, Cheshire, CW7 4AX. (Tel: Winsford 51374.)

## We want to hear from you!

Whether you are starting a new club, holding a special meeting, or just changing the venue, we want to hear from you.

Write to David Kelly, Club News, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF or call him on 01-930 3271.

## Black

Learn to combat the greatest peril of space. By Dave Middleton

You are captain of a small spaceship carrying damaged androids to a repair ship and the quicker you get to the ship the larger your bonus. Your ship is fitted with only crude instruments which give your velocity components in the x and y directions of motion.

Long range scanning has already shown that there is a black hole in the area but because black holes do not emit light you obviously cannot see it. You will have to rely on gravitational effects on your velocity to fix its position on the screen.

Like any true space ship once you have accelerated to a velocity by giving thrust in one direction you have to thrust in the opposite direction to reduce velocity again.

If you move your ship out of the quadrant you are in, your on-board

computer will advise you to use your warp drive and give you your current x,y position relative to the repair ship which is at co-ordinates 1,1; you still have control of your ship however and can manoeuvre using the normal controls. If you use the warp drive you will usually end up in the vicinity of the black hole but at least your ship will be back under control again.

#### How to get to the repair ship

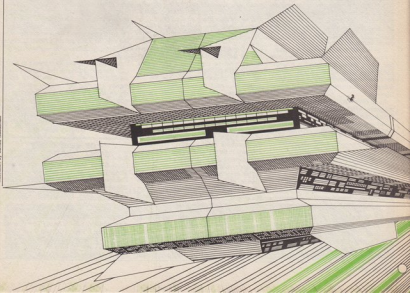
The easiest way is to move outside quadrant, out of the gravitational effects of the black hole and fly by watching the x,y co-ordinates change. The average time I achieved for this was between 45 and 55 hours.

The more skillful way is to move diagonally across the screen and make use of the whiplash effect. The velocity component added by the black hole is inversely proportional to your distance from it, so if you go too

close you will end up with a velocity which will either destroy your ship or fling you out at an uncontrollable speed. However if you get your approach correct your ship will be accelerated around the black hole into the vicinity of your repair ship. It is then a simple matter of decelerating and docking. The best time I achieved using this method was 20 hours. (You still have to spend some time outside the quadrant).

The game is in real time so you have to make your decisions quickly or another 'hour' will be added to your travel time.

To control your ship use the unshifted cursor keys. Pressing a key adds one velocity component in the direction the arrow is pointing, the key only works while information is being displayed. Positive x-velocity moves the ship to the right and positive y-velocity moves the ship down. Press 'w' if you are either too close to the black hole or you have lost control of your ship.





[illegible]

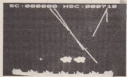
```

0034 IF X<=25 THEN PRINT "YOU WZ
1135 LL GET A HUGE BONUS"
1136 IF T>500 THEN PRINT "TOO LAT
1137 TO GET A BONUS"
1138 IF Y<500 AND T>500 THEN PRINT
"YOU GET A SMALL BONUS"
1139 GOTO 2000
1140 PRINT "YOU JUST CRASHED IN O
0041 THE SEA"
0042 PRINT "REPAIR SHIP, KILLING
A LOT
1070 PRINT "OF PEOPLE"
0043 GOTO 2000
0044 REM GRAVITY EFFECT OF BLACK
HOLE
0045 LET X=X-X
0046 LET Y=Y-Y
0047 GOSUB 2000
0048 LET X=X+X4
0049 LET Y=Y+Y4
0050 LET V1=X1+Y1
0051 LET V2=Y1+Y1
0052 GOSUB 2000
0053 LET X=X+X4
0054 LET Y=Y+Y4
0055 RETURN
0056 LET X=X+X1
0057 LET Y=Y+Y1
0058 LET C=INT (100/500*(X4+Y4+V
0059
0060
0061
0062
0063
0064 LET RH=PI/2
0065 GOTO 5045
0066 LET Q=PI*TN (X4/Y4)
0067 LET X=X*INT (1+14*COS Q)/1
0068 LET Y=Y*INT (1+14*SIN Q)/1
0069 IF X<0 THEN LET X=X*-X
0070 IF Y<0 THEN LET Y=Y*-Y
0071
0072 REM UNEXP DRIVE
0073 LET X=INT (15*RN+200)
0074 LET Y=INT (15*RN+151)
0075 LET X=X*INT (X1/2)
0076 LET Y=Y*INT (Y1/2)
0077 GOTO 5045

```

# Reviews

## software



### Missile Command

Available from Hi-Tech or any Commodore Vic Dealer. Price £8.75.

All right, I admit it, I'm hooked! Another reproduction of a popular arcade game, this requires an additional 3K of RAM before the action can commence. It can be played using either the keyboard or a joystick, and a joystick is certainly to be preferred. Using the keyboard tends to get your fingers tied up in knots as you desperately try to press nineteen keys at the same time.

The same takes a while to load, as there is one setting up program before the main one comes in. Having selected keyboard or joystick control, sit back and wait for a few minutes while the second program is loaded. Once you've got there, you're in for a frantic time! You are defending five cities, which are under siege by missiles raining down from above. The method of defence is quite ingenious: you control a set of sights, which race about the screen at breakneck speed (they need to). When the sight is in an appropriate position, usually just in front of one of the missiles coming down, pressing the fire button launches a counter missile of your own, aimed at your sights. When it gets there, explosions occur, and the ensuing debris wipes out any enemy missiles which blunder into it.

However, any of the missiles which get through your defences are more than capable of wiping out a city if they score a direct hit, and when all your cities go...

To score, you must demolish the enemy missiles, and use as few of your own missiles as possible, since you get points for any that remain after a particular attack wave is completed. The missiles come down in droves, and every wave gets successively more frantic, with seemingly hundreds pouring down at a time. There is a way of surviving this, which entails setting up a 'line' of your own missiles across the bottom of the screen, and hoping that the enemy missiles run out before your own do.

#### Summary

An extremely addictive game, and a fairly good reproduction of the existing arcade

game. This is a difficult one for manufacturers to tackle, as the original game had a very novel way of moving your sights across the screen, and one which is not reproducible on any microcomputer. The efforts that Hi-Tech have put into being as faithful to the original as they could, considering the limitations imposed upon them, are commendable. A very good game.

PG

### Party Tricks

Video Software, Stone Lane, Kinver, West Midlands. ZX81 1K cassette, Price £4.95.

So Video Software, long a supplier of sophisticated up-market 16K software for small businesses and training, is lowering its sights! They have just launched this cassette, containing ten BASIC 1K routines and promise more.

The kind of party they're aiming at is for children, I think. Introducing something different for children's parties is a major cause of ulcers in certain circles — to have a ZX81 play session can't be bad.

However, there are doubtless plenty of adults who will enjoy much of the material here, even if the overall novelty is not in the same league as that of, say, the Orwin packages or the "adult" games from Automata.

Video Software shows rather poor marketing in putting the least exciting programs first. We have *Shoot* — where you are taking a penalty which the goalie has to try to save; *Sketch* — differing from the million other etch-a-sketches only by having a SAVE facility; *Name The Day* — giving weekday for any date; and *Train* — you drive a train, in forward or reverse, along a track.

These are all fairly good, even if hardly world-shattering. Later programs are better. They include *Onger-Wonger* (a picture-drawing routine); *Weather* (a variant on the random poetry genre); *UFO* (shoot down the single space invader); *Who Shot JR?* (ZX81 Cluedo); *Field-Gun* (a nice target practise game); and *Follow* (you must copy the micro's wiggly path across the screen).

Video Software's well-known high-quality of presentation is used with this 1K package.

For your money you get a good cassette, with a set of saves on each side, and an impressive 26-page booklet.

#### Summary

Near top marks for this collection of 1K ZX81 programs — fun for all, and useful for those struggling to get into Sinclair BASIC.

KJL

### Jungle Maths

SciSoft, 5 Minster Gardens, Newthorpe, Eastwood, Notts.  
ZX81 16K cassette.  
Price £4.50.

It was with a great thrill of anticipation that I prepared to look at this package. There is not much material yet for ZX81 teaching, and a huge need. SciSoft's material is nicely packaged, not too costly and comes with a separate four-page leaflet.

But the thrill soon died down. The leaflet has been hastily and poorly written — there are ten grammatical errors in the eleven-sentence description of the material, for instance. And the recording quality on the cassette is very reminiscent of what we had to put up with nine months ago — the signal on one side was so weak that loading was impossible; that on the other was not quite as bad, but still bad.

Such lack of attention to detail is bad practice in any kind of software. It is not at all excusable where children's learning is concerned.

The half-pence of tar are missing throughout the program that I loaded as well — slow reaction to key presses, punctuation marks missing, poor screen layout generally, inappropriate language, inadequate mugging.

There are matters too that any competent maths teacher would frown on severely: inadequate restrictions on the questions posed, use of the "less than" symbol, incorrect use of the word "decimal".

All this is a great pity. SciSoft had a lovely idea — why, oh why, didn't they carry it right to the end before rushing to the market place?

The lovely idea is of course to link the educationist's need for drill programs to the child's need for games.

In *Jungle Maths* you must move across the screen avoiding a (rather strange) collection of hazards by answering the posed questions correctly.

Type of question (from the four rules), range and type of numbers involved, and time limit may all be selected during the initial stages.

The hazards involve rather laborious moving graphics, but the children enjoyed them (despite their horrific nature) — they probably can't readily be improved without machine code. All the same, tar needs application to the BASIC coding generally.

#### Summary

An excellent idea — parents and teachers need this kind of program. It is a great pity that the authors haven't worked a bit longer on the coding: it is to be hoped that a polished version will soon appear. KJ

# Reviews

## hardware

### Beebox

Available from Beelines Limited.  
Price £220 plus VAT.

This neat, compact unit, which sits underneath your Vic, is designed to give you a 40 column by 25 line display, and increase the amount of available memory from 3K to 32K. It connects up to the expansion socket on the Vic, but has a further socket of its own, so nothing is lost and quite a bit gained.

All this sounds very impressive, but is it as good as it's cracked-up to be? The company's description creates the impression that a true 40 x 25 screen area is available on which you could merrily program impressive graphics for anything from arcade games to word processing packages. Not so.

On connecting up the unit and powering it all up, you have lost the traditional 'window' screen display of the Vic, and the whole screen is there for you to marvel at. This is somewhat reminiscent of the old Commodore Pet 4032 display. The old Vic appearance is not all you've lost however. Also gone are the Vic graphics, and indeed just about everything you've become familiar with. In their place is the Prestel character set, which in its defence is quite impressive, and a variety of other control characters. For some reason best known to Beelines, actioning these involves positioning them on the screen, thus losing some of the much valued 40 x 25 area.

These control characters include a facility to produce double height characters, flashing characters, and so on. What you can't do is alter the background colouring: you start off with white on a black background, and black it will remain, whatever you try and do about it.

One further unfortunate feature is that you cannot revert to the ordinary Vic screen, once that board is wired up. To get back into Vic mode you have to disconnect everything and start again. It would have been nice to be able to swap from one to the other at will.

On the plus side, the colour quality looks distinctly better than on a normal Vic, although there is a slight shimmer when scrolling through a listing.

#### Summary

It does give you an extra amount of memory, and all told is probably fairly cheap for an additional 29K of RAM and a 40 x 25 display area, even if it is only a display area. At £220 it will probably be of most use to the businessman who wants to use a larger area (for say stock control, or whatever), but for the average hobbyist I would say that it's a waste of time. **PG**



### 20 Simple Projects

By Stephen Adams, published by Interface, 44-46 Earls Court Road, London W8 Price £6.45.

This is the latest offering from the Interface publishing house that specialises in books for home computer users, in particular Sinclair users.

Author Stephen Adams is well-known in the microcomputer world as the man who knows his way around Sinclair hardware, and who has had much of his work published in the microcomputer press. The idea of this book is a good one, microcomputer hardware projects being a subject not often covered in magazines.

Adams makes no claims about the quality of his projects, each being the cheapest and simplest way of performing a task, not necessarily the best. For this reason the book deserves praise as a source of ideas or questions, rather than answers. Adams has provided you with the route, it's up to you to explore it.

Some of the projects are specific to the ZX81, but not so many that other computer users will feel left out. The circuit diagrams use a non-standard series of symbols, but are clear enough. As in other Interface books, there are a lot of pictures that have no relationship with the text — an interesting quirk. One other point I find most annoying is the liberal use of upper case letters throughout the book.

It should be remembered that books of this nature are not judged by the quality of their production, but by the information they contain, and this book contains a fair amount of that. The construction projects contain a minimum of software, concentrating on the electronics.

Among them are a tape recorder control, which every computer user will find handy, a light pen, which is the ultimate in low-technology, and an analogue to digital converter. **SB**

### ZX81 EPROM board

EPROM Services, 3 Wedgewood Drive, Leeds LS8 1EF. Tel: 0532 667183. Prices: board, £17.50 including p&p; EPROM, £3 each and programming them £2/K.

This printed circuit board comes ready made to connect up to your ZX81 and provide it with your own "commands" stored as subroutines in a ROM.

The type of ROM used is called an EPROM which means it can be erased by ultra violet light and reprogrammed.

The board can take four 2716 (+5 volt type) EPROMs and connect up to the 16K pack as well.

The EPROM can be programmed by you or the company which supplies the board. EPROM Services supply the complete service, erasing the EPROM and reprogramming it from your machine code listing. The advantage of using this method of program storage is that no RAM is used up and the program is still safe in the ROM when the power is switched off.

The space allocated to the EPROMs on the board is 8K to 16K in the memory map, but due to the fact that only one IC is used to decode the address, it also appears in the 40K to 48K section as well. This means that you are limited to 16K of RAM as the Sinclair ROM takes up the space from 32K to 40K.

The instructions for inserting the EPROMs are easy to understand and include instructions on how to alter the board so that it can take 6116 RAMs instead.

The board arrived with an EPROM containing seven machine code routines, in the first 2K socket. They were RENUMBER (in steps of 10, starting from 10, but with no GOSUBs or GOTOs altered), FREE MEMORY, PROGRAM LENGTH, MEMORY LENGTH, FILL (fills the screen with the character selected).

The last two convert decimal numbers POKED into the system variables to hexadecimal numbers printed on the screen. There were a couple of errors in the last two, due to address changes being made but not clearly explained. The address changes were 16514/16515 to 16507/16508.

This EPROM board could be very useful on saving RAM, if you can write your own routines in machine code (EPROM services intend to make more programs available soon).

It does however restrict the amount of RAM you can use and as a number of boards that plug into the same address space, you will be limited as to what sockets you can use. **SA**



# Open Forum

Open Forum is for you to publish your programs and ideas.

It is important that your programs are bug free before you send them in. We cannot test all of them.

Contributions should be sent to: Popular Computing Weekly, Hobhouse Court,  
19 Whitcomb Street, London WC2H 7HF.

## Flashing pound

on Vic-20

This program places the Vic pound sign as a defined character randomly on the screen and then scrolls it in pixel format vertically in its cell space.

Lines 150 to 190 copy the character down, redefine the space character and switch the character sets. Lines 200 to 240 move the bytes through the character cell to perform the scroll.

If the same routine was applied to more characters in machine code it should be possible to move displays on the screen in fine scroll, thus opening up interesting areas in the games and visual presentation fields.

### Flashing pound by Chris Palmer

```
10 REM FLOATING POUND
20 REM
30 REM CHRIS PALMER
40
50
60 SC=7680:CL=36480
70 CH=256:CB=7168
80 PRINT"7"
90 POKE 36879,0
100 FOR I=1 TO 10
110 PS=INT(RND(1)*586+1)
120 POKE SC+PS,20
130 POKE CL+PS,7
140 NEXT
150 FOR I=8 TO 7
160 POKECB+I+CH,PEEK(32768+I+CH)
170 POKE CB+3248+I,0
180 NEXT
190 POKE26869,255
200 TV=PEEK(CB+CH)
210 FOR I=0 TO 6
220 POKECB+CH+I,PEEK(CB+CH+I+1)
230 NEXT
240 POKE CB+7+CH,TV
250 GOTO 280
```

## YOUR PROGRAM COULD WIN A PRIZE!

Each week the editor goes through all the programs that you send to Open Forum in order to find the Program of the Week.

The author of that program will qualify for DOUBLE the usual fee we pay for published programs (the usual fee is £10).

Programs which are most likely to be considered for the Star Prize will be computer printed and accompanied by a cassette.

The programs will be well documented, the documentation being typed with a double spacing between each line. The documentation should start with a general description of the program and then give some detail of how the program has been constructed and of its special features.

Listings taken from a ZX Printer should be cut into convenient lengths and stuck down on to white paper.

Please enclose a self-addressed envelope.

### Cone by Jeremy Rowntree

```
10 REM 3-D CONE
20 REM BY J.ROWNTREE
30 REM AND S.LINDSAY
40 REM FOR BBC MICRO
50 REM
60 MODE 0
70 REM DEFINE COORDS
80 FOR I=1,2,3,4,5,6,7,8,9,10
90 A=60:B=130
100 MOVE A,3:PL0T 22,A,1000
110 2*HBB(180)+200*(H*HBB(100)+H)
120 1+H/2*(H*HBB(10)+25*(H*HBB(10)+1)
130 MOVE A,3+H
140 FOR X=0 TO 2*PI STEP 31.4159
150 SKEW A+2*HBB(10),B+H*HBB(10)
160 NEXT X
170 FOR Q=0 TO 2*PI STEP 31.4159
180 MOVE A+2*HBB(10),B+H*HBB(10)+Q*(H*HBB(10)+H)
190 NEXT Q
200 SKEW A+2*HBB(10),B+H*HBB(10)+Q*(H*HBB(10)+H)
210 FOR THE "H" AT LINE 200
220 V=H/2*200
230 H=2*V
240 GOTO 130
```

## Cone

on BBC Micro

This program will run on a BBC Micro Model A or B in any available graphics mode. When RUN it will draw a random cone in 3D in the form of a moulded grid.

The screen colours are defined at Line 80; the '2' sets the foreground, ie plotting, colour to green while the '7' sets the background, ie screen, colour to white.

These numbers can be altered to give different colours: 1 — red; 2 — green; 3 — yellow; 4 — blue; etc.

### Program notes

Lines 90-120 define a random ellipse, centre A, B; major axis J; minor axis K. This ellipse is then plotted by Lines 130-160.

V and S define how the next ellipse relates to this one — V = vertical distance between them, S = amount by which ellipse shrinks — while I keep the ratio of the axes constant. Lines 170-190 draw lines connecting the ellipses.

Line 220 adjusts the vertical step as the cone is plotted causing the shape to curve — with a '-' sign it curves inwards while with a '+' sign it curves outwards.

The STEP in Line 140 can be altered to give a more rapid plot (try PI/90) at the expense of resolution while altering the STEP in Line 170 will vary the spacing of the vertical lines.

## Depth charge

on ZX81

In this program you command a frigate with a substantial supply of depth-charges. You must destroy the submarines, which travel at various depths, before five parts of the dam-wall are destroyed. The deeper the

to next page

from previous page

submarines are the more you score for hitting them.

You can move your frigate with the "5" and "8" arrow keys. To drop a depth-charge you have to press "6". The submarines will continue to move even after you have dropped a depth-charge but with a more inconsistent movement.

To start the game from the instructions you have to press NEW-LINE.

## Program notes

Lines 1 to 10 set up the main variables, 15 and 16 set up the screen by calling a sub-routine at 1000.

Lines 20 to 250 make up the main body of the program.

Lines 270 to 295 make an explosion when the depth-charge reaches the lowest point it can move to and has not hit anything.

Lines 300 to 395 generate and move the submarine.

Lines 400 to 470 create an explosion and increment the score when a submarine is hit.

Lines 500 and 610 finish the program when five parts of the dam-wall have been destroyed.

Lines 1000 to 1110 generate the screen display.

Lines 2000 to 2110 print out the instructions.

```

370 IF C=0 THEN GOTO 600
380 LET S=0
390 FOR I=1 TO 5
400 PRINT " "
410 PRINT " "
420 PRINT " "
430 PRINT " "
440 PRINT " "
450 PRINT " "
460 PRINT " "
470 PRINT " "
480 PRINT " "
490 PRINT " "
500 PRINT " "
510 PRINT " "
520 PRINT " "
530 PRINT " "
540 PRINT " "
550 PRINT " "
560 PRINT " "
570 PRINT " "
580 PRINT " "
590 PRINT " "
600 PRINT " "
610 PRINT " "
620 PRINT " "
630 PRINT " "
640 PRINT " "
650 PRINT " "
660 PRINT " "
670 PRINT " "
680 PRINT " "
690 PRINT " "
700 PRINT " "
710 PRINT " "
720 PRINT " "
730 PRINT " "
740 PRINT " "
750 PRINT " "
760 PRINT " "
770 PRINT " "
780 PRINT " "
790 PRINT " "
800 PRINT " "
810 PRINT " "
820 PRINT " "
830 PRINT " "
840 PRINT " "
850 PRINT " "
860 PRINT " "
870 PRINT " "
880 PRINT " "
890 PRINT " "
900 PRINT " "
910 PRINT " "
920 PRINT " "
930 PRINT " "
940 PRINT " "
950 PRINT " "
960 PRINT " "
970 PRINT " "
980 PRINT " "
990 PRINT " "
1000 PRINT " "
1010 PRINT " "
1020 PRINT " "
1030 PRINT " "
1040 PRINT " "
1050 PRINT " "
1060 PRINT " "
1070 PRINT " "
1080 PRINT " "
1090 PRINT " "
1100 PRINT " "
1110 PRINT " "
1120 PRINT " "
1130 PRINT " "
1140 PRINT " "
1150 PRINT " "
1160 PRINT " "
1170 PRINT " "
1180 PRINT " "
1190 PRINT " "
1200 PRINT " "
1210 PRINT " "
1220 PRINT " "
1230 PRINT " "
1240 PRINT " "
1250 PRINT " "
1260 PRINT " "
1270 PRINT " "
1280 PRINT " "
1290 PRINT " "
1300 PRINT " "
1310 PRINT " "
1320 PRINT " "
1330 PRINT " "
1340 PRINT " "
1350 PRINT " "
1360 PRINT " "
1370 PRINT " "
1380 PRINT " "
1390 PRINT " "
1400 PRINT " "
1410 PRINT " "
1420 PRINT " "
1430 PRINT " "
1440 PRINT " "
1450 PRINT " "
1460 PRINT " "
1470 PRINT " "
1480 PRINT " "
1490 PRINT " "
1500 PRINT " "
1510 PRINT " "
1520 PRINT " "
1530 PRINT " "
1540 PRINT " "
1550 PRINT " "
1560 PRINT " "
1570 PRINT " "
1580 PRINT " "
1590 PRINT " "
1600 PRINT " "
1610 PRINT " "
1620 PRINT " "
1630 PRINT " "
1640 PRINT " "
1650 PRINT " "
1660 PRINT " "
1670 PRINT " "
1680 PRINT " "
1690 PRINT " "
1700 PRINT " "
1710 PRINT " "
1720 PRINT " "
1730 PRINT " "
1740 PRINT " "
1750 PRINT " "
1760 PRINT " "
1770 PRINT " "
1780 PRINT " "
1790 PRINT " "
1800 PRINT " "
1810 PRINT " "
1820 PRINT " "
1830 PRINT " "
1840 PRINT " "
1850 PRINT " "
1860 PRINT " "
1870 PRINT " "
1880 PRINT " "
1890 PRINT " "
1900 PRINT " "
1910 PRINT " "
1920 PRINT " "
1930 PRINT " "
1940 PRINT " "
1950 PRINT " "
1960 PRINT " "
1970 PRINT " "
1980 PRINT " "
1990 PRINT " "
2000 PRINT " "
2010 PRINT " "
2020 PRINT " "
2030 PRINT " "
2040 PRINT " "
2050 PRINT " "
2060 PRINT " "
2070 PRINT " "
2080 PRINT " "
2090 PRINT " "
2100 PRINT " "
2110 PRINT " "
2120 PRINT " "
2130 PRINT " "
2140 PRINT " "
2150 PRINT " "
2160 PRINT " "
2170 PRINT " "
2180 PRINT " "
2190 PRINT " "
2200 PRINT " "
2210 PRINT " "
2220 PRINT " "
2230 PRINT " "
2240 PRINT " "
2250 PRINT " "
2260 PRINT " "
2270 PRINT " "
2280 PRINT " "
2290 PRINT " "
2300 PRINT " "
2310 PRINT " "
2320 PRINT " "
2330 PRINT " "
2340 PRINT " "
2350 PRINT " "
2360 PRINT " "
2370 PRINT " "
2380 PRINT " "
2390 PRINT " "
2400 PRINT " "
2410 PRINT " "
2420 PRINT " "
2430 PRINT " "
2440 PRINT " "
2450 PRINT " "
2460 PRINT " "
2470 PRINT " "
2480 PRINT " "
2490 PRINT " "
2500 PRINT " "
2510 PRINT " "
2520 PRINT " "
2530 PRINT " "
2540 PRINT " "
2550 PRINT " "
2560 PRINT " "
2570 PRINT " "
2580 PRINT " "
2590 PRINT " "
2600 PRINT " "
2610 PRINT " "
2620 PRINT " "
2630 PRINT " "
2640 PRINT " "
2650 PRINT " "
2660 PRINT " "
2670 PRINT " "
2680 PRINT " "
2690 PRINT " "
2700 PRINT " "
2710 PRINT " "
2720 PRINT " "
2730 PRINT " "
2740 PRINT " "
2750 PRINT " "
2760 PRINT " "
2770 PRINT " "
2780 PRINT " "
2790 PRINT " "
2800 PRINT " "
2810 PRINT " "
2820 PRINT " "
2830 PRINT " "
2840 PRINT " "
2850 PRINT " "
2860 PRINT " "
2870 PRINT " "
2880 PRINT " "
2890 PRINT " "
2900 PRINT " "
2910 PRINT " "
2920 PRINT " "
2930 PRINT " "
2940 PRINT " "
2950 PRINT " "
2960 PRINT " "
2970 PRINT " "
2980 PRINT " "
2990 PRINT " "
3000 PRINT " "
3010 PRINT " "
3020 PRINT " "
3030 PRINT " "
3040 PRINT " "
3050 PRINT " "
3060 PRINT " "
3070 PRINT " "
3080 PRINT " "
3090 PRINT " "
3100 PRINT " "
3110 PRINT " "
3120 PRINT " "
3130 PRINT " "
3140 PRINT " "
3150 PRINT " "
3160 PRINT " "
3170 PRINT " "
3180 PRINT " "
3190 PRINT " "
3200 PRINT " "
3210 PRINT " "
3220 PRINT " "
3230 PRINT " "
3240 PRINT " "
3250 PRINT " "
3260 PRINT " "
3270 PRINT " "
3280 PRINT " "
3290 PRINT " "
3300 PRINT " "
3310 PRINT " "
3320 PRINT " "
3330 PRINT " "
3340 PRINT " "
3350 PRINT " "
3360 PRINT " "
3370 PRINT " "
3380 PRINT " "
3390 PRINT " "
3400 PRINT " "
3410 PRINT " "
3420 PRINT " "
3430 PRINT " "
3440 PRINT " "
3450 PRINT " "
3460 PRINT " "
3470 PRINT " "
3480 PRINT " "
3490 PRINT " "
3500 PRINT " "
3510 PRINT " "
3520 PRINT " "
3530 PRINT " "
3540 PRINT " "
3550 PRINT " "
3560 PRINT " "
3570 PRINT " "
3580 PRINT " "
3590 PRINT " "
3600 PRINT " "
3610 PRINT " "
3620 PRINT " "
3630 PRINT " "
3640 PRINT " "
3650 PRINT " "
3660 PRINT " "
3670 PRINT " "
3680 PRINT " "
3690 PRINT " "
3700 PRINT " "
3710 PRINT " "
3720 PRINT " "
3730 PRINT " "
3740 PRINT " "
3750 PRINT " "
3760 PRINT " "
3770 PRINT " "
3780 PRINT " "
3790 PRINT " "
3800 PRINT " "
3810 PRINT " "
3820 PRINT " "
3830 PRINT " "
3840 PRINT " "
3850 PRINT " "
3860 PRINT " "
3870 PRINT " "
3880 PRINT " "
3890 PRINT " "
3900 PRINT " "
3910 PRINT " "
3920 PRINT " "
3930 PRINT " "
3940 PRINT " "
3950 PRINT " "
3960 PRINT " "
3970 PRINT " "
3980 PRINT " "
3990 PRINT " "
4000 PRINT " "
4010 PRINT " "
4020 PRINT " "
4030 PRINT " "
4040 PRINT " "
4050 PRINT " "
4060 PRINT " "
4070 PRINT " "
4080 PRINT " "
4090 PRINT " "
4100 PRINT " "
4110 PRINT " "
4120 PRINT " "
4130 PRINT " "
4140 PRINT " "
4150 PRINT " "
4160 PRINT " "
4170 PRINT " "
4180 PRINT " "
4190 PRINT " "
4200 PRINT " "
4210 PRINT " "
4220 PRINT " "
4230 PRINT " "
4240 PRINT " "
4250 PRINT " "
4260 PRINT " "
4270 PRINT " "
4280 PRINT " "
4290 PRINT " "
4300 PRINT " "
4310 PRINT " "
4320 PRINT " "
4330 PRINT " "
4340 PRINT " "
4350 PRINT " "
4360 PRINT " "
4370 PRINT " "
4380 PRINT " "
4390 PRINT " "
4400 PRINT " "
4410 PRINT " "
4420 PRINT " "
4430 PRINT " "
4440 PRINT " "
4450 PRINT " "
4460 PRINT " "
4470 PRINT " "
4480 PRINT " "
4490 PRINT " "
4500 PRINT " "
4510 PRINT " "
4520 PRINT " "
4530 PRINT " "
4540 PRINT " "
4550 PRINT " "
4560 PRINT " "
4570 PRINT " "
4580 PRINT " "
4590 PRINT " "
4600 PRINT " "
4610 PRINT " "
4620 PRINT " "
4630 PRINT " "
4640 PRINT " "
4650 PRINT " "
4660 PRINT " "
4670 PRINT " "
4680 PRINT " "
4690 PRINT " "
4700 PRINT " "
4710 PRINT " "
4720 PRINT " "
4730 PRINT " "
4740 PRINT " "
4750 PRINT " "
4760 PRINT " "
4770 PRINT " "
4780 PRINT " "
4790 PRINT " "
4800 PRINT " "
4810 PRINT " "
4820 PRINT " "
4830 PRINT " "
4840 PRINT " "
4850 PRINT " "
4860 PRINT " "
4870 PRINT " "
4880 PRINT " "
4890 PRINT " "
4900 PRINT " "
4910 PRINT " "
4920 PRINT " "
4930 PRINT " "
4940 PRINT " "
4950 PRINT " "
4960 PRINT " "
4970 PRINT " "
4980 PRINT " "
4990 PRINT " "
5000 PRINT " "
5010 PRINT " "
5020 PRINT " "
5030 PRINT " "
5040 PRINT " "
5050 PRINT " "
5060 PRINT " "
5070 PRINT " "
5080 PRINT " "
5090 PRINT " "
5100 PRINT " "
5110 PRINT " "
5120 PRINT " "
5130 PRINT " "
5140 PRINT " "
5150 PRINT " "
5160 PRINT " "
5170 PRINT " "
5180 PRINT " "
5190 PRINT " "
5200 PRINT " "
5210 PRINT " "
5220 PRINT " "
5230 PRINT " "
5240 PRINT " "
5250 PRINT " "
5260 PRINT " "
5270 PRINT " "
5280 PRINT " "
5290 PRINT " "
5300 PRINT " "
5310 PRINT " "
5320 PRINT " "
5330 PRINT " "
5340 PRINT " "
5350 PRINT " "
5360 PRINT " "
5370 PRINT " "
5380 PRINT " "
5390 PRINT " "
5400 PRINT " "
5410 PRINT " "
5420 PRINT " "
5430 PRINT " "
5440 PRINT " "
5450 PRINT " "
5460 PRINT " "
5470 PRINT " "
5480 PRINT " "
5490 PRINT " "
5500 PRINT " "
5510 PRINT " "
5520 PRINT " "
5530 PRINT " "
5540 PRINT " "
5550 PRINT " "
5560 PRINT " "
5570 PRINT " "
5580 PRINT " "
5590 PRINT " "
5600 PRINT " "
5610 PRINT " "
5620 PRINT " "
5630 PRINT " "
5640 PRINT " "
5650 PRINT " "
5660 PRINT " "
5670 PRINT " "
5680 PRINT " "
5690 PRINT " "
5700 PRINT " "
5710 PRINT " "
5720 PRINT " "
5730 PRINT " "
5740 PRINT " "
5750 PRINT " "
5760 PRINT " "
5770 PRINT " "
5780 PRINT " "
5790 PRINT " "
5800 PRINT " "
5810 PRINT " "
5820 PRINT " "
5830 PRINT " "
5840 PRINT " "
5850 PRINT " "
5860 PRINT " "
5870 PRINT " "
5880 PRINT " "
5890 PRINT " "
5900 PRINT " "
5910 PRINT " "
5920 PRINT " "
5930 PRINT " "
5940 PRINT " "
5950 PRINT " "
5960 PRINT " "
5970 PRINT " "
5980 PRINT " "
5990 PRINT " "
6000 PRINT " "
6010 PRINT " "
6020 PRINT " "
6030 PRINT " "
6040 PRINT " "
6050 PRINT " "
6060 PRINT " "
6070 PRINT " "
6080 PRINT " "
6090 PRINT " "
6100 PRINT " "
6110 PRINT " "
6120 PRINT " "
6130 PRINT " "
6140 PRINT " "
6150 PRINT " "
6160 PRINT " "
6170 PRINT " "
6180 PRINT " "
6190 PRINT " "
6200 PRINT " "
6210 PRINT " "
6220 PRINT " "
6230 PRINT " "
6240 PRINT " "
6250 PRINT " "
6260 PRINT " "
6270 PRINT " "
6280 PRINT " "
6290 PRINT " "
6300 PRINT " "
6310 PRINT " "
6320 PRINT " "
6330 PRINT " "
6340 PRINT " "
6350 PRINT " "
6360 PRINT " "
6370 PRINT " "
6380 PRINT " "
6390 PRINT " "
6400 PRINT " "
6410 PRINT " "
6420 PRINT " "
6430 PRINT " "
6440 PRINT " "
6450 PRINT " "
6460 PRINT " "
6470 PRINT " "
6480 PRINT " "
6490 PRINT " "
6500 PRINT " "
6510 PRINT " "
6520 PRINT " "
6530 PRINT " "
6540 PRINT " "
6550 PRINT " "
6560 PRINT " "
6570 PRINT " "
6580 PRINT " "
6590 PRINT " "
6600 PRINT " "
6610 PRINT " "
6620 PRINT " "
6630 PRINT " "
6640 PRINT " "
6650 PRINT " "
6660 PRINT " "
6670 PRINT " "
6680 PRINT " "
6690 PRINT " "
6700 PRINT " "
6710 PRINT " "
6720 PRINT " "
6730 PRINT " "
6740 PRINT " "
6750 PRINT " "
6760 PRINT " "
6770 PRINT " "
6780 PRINT " "
6790 PRINT " "
6800 PRINT " "
6810 PRINT " "
6820 PRINT " "
6830 PRINT " "
6840 PRINT " "
6850 PRINT " "
6860 PRINT " "
6870 PRINT " "
6880 PRINT " "
6890 PRINT " "
6900 PRINT " "
6910 PRINT " "
6920 PRINT " "
6930 PRINT " "
6940 PRINT " "
6950 PRINT " "
6960 PRINT " "
6970 PRINT " "
6980 PRINT " "
6990 PRINT " "
7000 PRINT " "
7010 PRINT " "
7020 PRINT " "
7030 PRINT " "
7040 PRINT " "
7050 PRINT " "
7060 PRINT " "
7070 PRINT " "
7080 PRINT " "
7090 PRINT " "
7100 PRINT " "
7110 PRINT " "
7120 PRINT " "
7130 PRINT " "
7140 PRINT " "
7150 PRINT " "
7160 PRINT " "
7170 PRINT " "
7180 PRINT " "
7190 PRINT " "
7200 PRINT " "
7210 PRINT " "
7220 PRINT " "
7230 PRINT " "
7240 PRINT " "
7250 PRINT " "
7260 PRINT " "
7270 PRINT " "
7280 PRINT " "
7290 PRINT " "
7300 PRINT " "
7310 PRINT " "
7320 PRINT " "
7330 PRINT " "
7340 PRINT " "
7350 PRINT " "
7360 PRINT " "
7370 PRINT " "
7380 PRINT " "
7390 PRINT " "
7400 PRINT " "
7410 PRINT " "
7420 PRINT " "
7430 PRINT " "
7440 PRINT " "
7450 PRINT " "
7460 PRINT " "
7470 PRINT " "
7480 PRINT " "
7490 PRINT " "
7500 PRINT " "
7510 PRINT " "
7520 PRINT " "
7530 PRINT " "
7540 PRINT " "
7550 PRINT " "
7560 PRINT " "
7570 PRINT " "
7580 PRINT " "
7590 PRINT " "
7600 PRINT " "
7610 PRINT " "
7620 PRINT " "
7630 PRINT " "
7640 PRINT " "
7650 PRINT " "
7660 PRINT " "
7670 PRINT " "
7680 PRINT " "
7690 PRINT " "
7700 PRINT " "
7710 PRINT " "
7720 PRINT " "
7730 PRINT " "
7740 PRINT " "
7750 PRINT " "
7760 PRINT " "
7770 PRINT " "
7780 PRINT " "
7790 PRINT " "
7800 PRINT " "
7810 PRINT " "
7820 PRINT " "
7830 PRINT " "
7840 PRINT " "
7850 PRINT " "
7860 PRINT " "
7870 PRINT " "
7880 PRINT " "
7890 PRINT " "
7900 PRINT " "
7910 PRINT " "
7920 PRINT " "
7930 PRINT " "
7940 PRINT " "
7950 PRINT " "
7960 PRINT " "
7970 PRINT " "
7980 PRINT " "
7990 PRINT " "
8000 PRINT " "
8010 PRINT " "
8020 PRINT " "
8030 PRINT " "
8040 PRINT " "
8050 PRINT " "
8060 PRINT " "
8070 PRINT " "
8080 PRINT " "
8090 PRINT " "
8100 PRINT " "
8110 PRINT " "
8120 PRINT " "
8130 PRINT " "
8140 PRINT " "
8150 PRINT " "
8160 PRINT " "
8170 PRINT " "
8180 PRINT " "
8190 PRINT " "
8200 PRINT " "
8210 PRINT " "
8220 PRINT " "
8230 PRINT " "
8240 PRINT " "
8250 PRINT " "
8260 PRINT " "
8270 PRINT " "
8280 PRINT " "
8290 PRINT " "
8300 PRINT " "
8310 PRINT " "
8320 PRINT " "
8330 PRINT " "
8340 PRINT " "
8350 PRINT " "
8360 PRINT " "
8370 PRINT " "
8380 PRINT " "
8390 PRINT " "
8400 PRINT " "
8410 PRINT " "
8420 PRINT " "
8430 PRINT " "
8440 PRINT " "
8450 PRINT " "
8460 PRINT " "
8470 PRINT " "
8480 PRINT " "
8490 PRINT " "
8500 PRINT " "
8510 PRINT " "
8520 PRINT " "
8530 PRINT " "
8540 PRINT " "
8550 PRINT " "
8560 PRINT " "
8570 PRINT " "
8580 PRINT " "
8590 PRINT " "
8600 PRINT " "
8610 PRINT " "
8620 PRINT " "
8630 PRINT " "
8640 PRINT " "
8650 PRINT " "
8660 PRINT " "
8670 PRINT " "
8680 PRINT " "
8690 PRINT " "
8700 PRINT " "
8710 PRINT " "
8720 PRINT " "
8730 PRINT " "
8740 PRINT " "
8750 PRINT " "
8760 PRINT " "
8770 PRINT " "
8780 PRINT " "
8790 PRINT " "
8800 PRINT " "
8810 PRINT " "
8820 PRINT " "
8830 PRINT " "
8840 PRINT " "
8850 PRINT " "
8860 PRINT " "
8870 PRINT " "
8880 PRINT " "
8890 PRINT " "
8900 PRINT " "
8910 PRINT " "
8920 PRINT " "
8930 PRINT " "
8940 PRINT " "
8950 PRINT " "
8960 PRINT " "
8970 PRINT " "
8980 PRINT " "
8990 PRINT " "
9000 PRINT " "
9010 PRINT " "
9020 PRINT " "
9030 PRINT " "
9040 PRINT " "
9050 PRINT " "
9060 PRINT " "
9070 PRINT " "
9080 PRINT " "
9090 PRINT " "
9100 PRINT " "
9110 PRINT " "
9120 PRINT " "
9130 PRINT " "
9140 PRINT " "
9150 PRINT " "
9160 PRINT " "
9170 PRINT " "
9180 PRINT " "
9190 PRINT " "
9200 PRINT " "
9210 PRINT " "
9220 PRINT " "
9230 PRINT " "
9240 PRINT " "
9250 PRINT " "
9260 PRINT " "
9270 PRINT " "
9280 PRINT " "
9290 PRINT " "
9300 PRINT " "
9310 PRINT " "
9320 PRINT " "
9330 PRINT " "
9340 PRINT " "
9350 PRINT " "
9360 PRINT " "
9370 PRINT " "
9380 PRINT " "
9390 PRINT " "
9400 PRINT " "
9410 PRINT " "
9420 PRINT " "
9430 PRINT " "
9440 PRINT " "
9450 PRINT " "
9460 PRINT " "
9470 PRINT " "
9480 PRINT " "
9490 PRINT " "
9500 PRINT " "
9510 PRINT " "
9520 PRINT " "
9530 PRINT " "
9540 PRINT " "
9550 PRINT " "
9560 PRINT " "
9570 PRINT " "
9580 PRINT " "
9590 PRINT " "
9600 PRINT " "
9610 PRINT " "
9620 PRINT " "
9630 PRINT " "
9640 PRINT " "
9650 PRINT " "
9660 PRINT " "
9670 PRINT " "
9680 PRINT " "
9690 PRINT " "
9700 PRINT " "
9710 PRINT " "
9720 PRINT " "
9730 PRINT " "
9740 PRINT " "
9750 PRINT " "
9760 PRINT " "
9770 PRINT " "
9780 PRINT " "
9790 PRINT " "
9800 PRINT " "
9810 PRINT " "
9820 PRINT " "
9830 PRINT " "
9840 PRINT " "
9850 PRINT " "
9860 PRINT " "
9870 PRINT " "
9880 PRINT " "
9890 PRINT " "
9900 PRINT " "
9910 PRINT " "
9920 PRINT " "
9930 PRINT " "
9940 PRINT " "
9950 PRINT " "
9960 PRINT " "
9970 PRINT " "
9980 PRINT " "
9990 PRINT " "
10000 PRINT " "

```

Figure 1

MOVE	NEW	N(P1,R1,C1)						
	Position							
start	+	+	+	+	10	0	0	10
of	+	+	+	+	0	0	0	0
game	+	+	+	+	0	0	0	0
(1)	1,1	0	+	+	10	0	0	
	+	+	+	+	20	10	10	20
	+	+	+	+	10	10	0	0
	+	+	+	+	10	0	10	0
	+	+	+	+	20	0	0	20
(2)	1,4	0	+	+	10	0	0	38
	+	+	+	+	10	10	14	14
	+	+	+	+	10	14	10	14
	+	+	+	+	34	0	0	34
(3)	1,2,1	0	+	+	108	0	0	38
	+	+	+	+	118	20	24	24
	+	+	+	+	108	14	10	14
	+	+	+	+	132	0	0	34
(4)	1,4,1	0	+	+	10	0	0	138
	+	+	+	+	20	20	124	24
	+	+	+	+	10	114	10	14
	X	+	+	+	148	14	14	48
(5)	1,2,2	0	+	+	108	10	0	138
	+	+	+	+	118	226	222	122
	+	+	+	+	10	124	108	14
	X	+	+	+	148	24	14	148
(6)	1,2,3	0	+	+	108	10	14	138
	0	0	X	+	20	128	138	24
	+	+	+	+	10	1124	122	14
	X	+	+	+	1148	24	28	148

## 3D noughts and crosses

on Vis-20

The following program is not only for the Pet/Vic, it can be for anybody who owns a computer that can handle data statements — if not then the array will have to be put in as LET A(1) = 2 etc.

After every move, the program first identifies all cells in a particular direction; it then determines the situation in that line by multiplying the cell values M(P1,R1,C1) together; finally, it adds a value S to the priority values N(P1,R1,C1) for the cells in line. S depends upon the line situation determined previously, as you will see.

## Figure 1 Illustrative game

For convenience, plays are only considered on the top plane. The player moves first with O's inputting Plane, Row, Column. The program replies on all even numbered moves with X's. Note that on all its moves the program has a choice of several moves, as cells N(P1,R1,C1) of the same value. After every move N(P1,R1,C1) is updated but only for cells in line with the move cell. Examination of each move in conjunction with figure 3 will make the process clear.

Note that N(P1,R1,C1) is updated even for already-occupied cells: checks could be introduced to avoid that, but the saving in time would probably not be very great.

Figure 2 Top plane of cube

```

0.0 0.0 0.0 0.0 0.0
0.0 0.1 0.1 0.1 0.1
0.0 0.1 0.2 0.2 0.3
0.0 0.1 0.2 0.3 0.3

```

Figure 3 Priority values for line situations

Line situation	Line value A(N)	Priority value B(N)
0 + + +	3	10
X + + +	3	14
0 0 + +	9	98
X X + +	4	100
0 0 0 +	27	900
X X X +	8	1000
0 X + +	6	-14
0 0 X +	18	-98
X 0 0 +	12	-100

Note that the last three values of b(n) are used only at certain times. If a line was already blocked, neither B(7) or B(8) is used — line 5040. If 0X++ is preceded by 0+++ , S is set to -10 line 5030.

Figure 4 Computation of - D -

```

SITUATION IN LINE: 0 + 0 +
VAL OF N(P1,R1,C1): 3 1 3 1
Value of D: 3X 1X 3X 1X

```

## Program notes

The program has been written deliberately to be machine-independent, and offers several opportunities for changes. Subroutine 2000, which draws the board after every move,

## Depth charge by Clive Carter

```

10000 PRINT " "
10010 PRINT " "
10020 PRINT " "
10030 PRINT " "
10040 PRINT " "
10050 PRINT " "
10060 PRINT " "
10070 PRINT " "
10080 PRINT " "
10090 PRINT " "
10100 PRINT " "
10110 PRINT " "
10120 PRINT " "
10130 PRINT " "
10140 PRINT " "
10150 PRINT " "
10160 PRINT " "
10170 PRINT " "
10180 PRINT " "
10190 PRINT " "
10200 PRINT " "
10210 PRINT " "
10220 PRINT " "
10230 PRINT " "
10240 PRINT " "
10250 PRINT " "
10260 PRINT " "
10270 PRINT " "
10280 PRINT " "
10290 PRINT " "
10300 PRINT " "
10310 PRINT " "
10320 PRINT " "
10330 PRINT " "
10340 PRINT " "
10350 PRINT " "
10360 PRINT " "
10370 PRINT " "
10380 PRINT " "
10390 PRINT " "
10400 PRINT " "
10410 PRINT " "
10420 PRINT " "
10430 PRINT " "
10440 PRINT " "
10450 PRINT " "
10460 PRINT " "
10470 PRINT " "
10480 PRINT " "
10490 PRINT " "
10500 PRINT " "
10510 PRINT " "
10520 PRINT " "
10530 PRINT " "
10540 PRINT " "
10550 PRINT " "
10560 PRINT " "
10570 PRINT " "
10580 PRINT " "
10590 PRINT " "
10600 PRINT " "
10610 PRINT " "
10620 PRINT " "
10630 PRINT " "
10640 PRINT " "
10650 PRINT " "
10660 PRINT " "
10670 PRINT " "
10680 PRINT " "
10690 PRINT " "
10700 PRINT " "
10710 PRINT " "

```

# Open Forum

could be revised using PEEK and POKE to give a static display.

If line 3050 is deleted, the program will now play the same replies in a new game if the player repeats moves from a previous game. Various strategies can be examined to determine the program's weaknesses.

For an alternative game, reverse the inequality signs in lines 3030 and 3040. The program will now play anti-noughts and crosses, trying to avoid creating lines of 10for. Remember also to change lines 5000 and 5020. If lines 140-170 are deleted, and this line is substituted:

```
140 GOSUB 3000:PRINT"YOUR MOVE
15"PRINT P+1,R+1,C+1
```

The computer will take both sides and play itself. Experimentation is possible with the program playing both parts with different versions of B(N). If the losing values of B(N) are modified while the winning values are retained, the program becomes self-teaching and will eventually improve.

The values of B(0)-B(8) are not optimal and can be varied to change the program's play — the only changes required are in line 20.

With a few extra lines the value can be altered according to who is playing eg low values for XXX\* and 0000\* when you play and very high when your friends play.

Please remember you input plane, row and column (P,R,C) as 1,1,1 not 111. Good luck!

## 3D noughts and crosses by Martin Burke

```
1 OPEN:4:4: ORD 1
5 POKE537,PEEK(537)+3:REM RUN /STOP OFF.
10 REM-SET UP BOARD & INITIALISE VARIABLES.-
20 DIMO(10,2,14,9,9):4,100,27,900,0,1000,0,-14,10,-99,12,-180
30 DIM KC(3,3,3),MC(3,3,3),AC(3,3,3)
40 D=1:RM="ROSE"
50 FOR P=0 TO 3:FOR R=0 TO 3:FOR C=0 TO 3
60 IF P=R AND P=C THEN 110
70 IF P=C AND P=3-R THEN 110
80 IF P=3-C AND P=C THEN 110
90 IF P=R AND P=3-C THEN 110
100 GOTO 120
110 MKP,R,C)=P
120 MKP,R,C)=NEXT C:NEXT R:NEXT P
130 FOR N=1 TO 8:READ A(N),END:NEXT N:GOSUB 2000
140 PRINT"INPUT YOUR MOVE"
150 INPUT P,R,C:PA=P-1:RA=R-1:CA=C-1
160 IF P<0 OR P>3 OR C<0 OR C>3 OR R<0 OR R>3 THEN 140
170 IF MKP,P,C)=1 THEN PRINT"CELL OCCUPIED":PRINT GOTO 140
180 MKP,P,C)=0:GOSUB 1000:GOSUB 2000:GOSUB 3000
190 PRINT"MY MOVE IS:"PA+1,RA+1,CA+1:MKP,PA+1,RA+1,CA+1
200 PRINT"MKP,P,C)=2:GOSUB1000:GOSUB2000:GOSUB3000
210 IF P=3:4 THEN PRINT"GAME DRAWN" :END
220 GOTO 140
300 REM** FIND ON WHICH LINES THE MOVE CELL LIES.**
1000 FOR D=1 TO 3:GOSUB 4000:NEXT D
1020 IF P=R AND P=C AND P=C THEN 1040
1030 IF P=THEN D=4:GOSUB 4000
1040 IF P=C THEN D=5:GOSUB 4000
1050 IF R=C THEN D=6:GOSUB 4000
1060 IF P=3-R AND P=3-C AND R=3-C THEN 110
1070 IF P=3-R THEN D=7:GOSUB 4000
1080 IF P=3-C THEN D=8:GOSUB 4000
1090 IF P=R=C THEN D=9:GOSUB 4000
1100 IF P=R AND P=3-C THEN D=10:GOSUB 4000
1110 IF P=C AND P=3-R THEN D=11:GOSUB 4000
1120 IF P=3-C AND R=C THEN D=12:GOSUB 4000
1130 IF P=R AND R=C THEN D=13:GOSUB 4000
1140 RETURN
1150 REM**CROSS**
2000 PRINTTAB(10);"COLUMNS":PRINT
3000 PRINTTAB(4);"1234 1234 1234 1234"
2030 FOR R=0 TO 3:PRINTTAB(R);R+1,1,1,R+1
2040 FOR P=0 TO 3:FOR C=0 TO 3
2050 ON MKP,P,C) GOTO 2070,2080
2060 PRINT"0":GOTO2090
2070 PRINT"X":GOTO2090
2080 PRINT"Y"
2090 NEXT C:PRINT" ":NEXT P:PRINT NEXT R:PRINT:PRINT:RETURN
2100 REM*****FIND CELL WITH HIGHEST PRIORITY VALUE*****
3000 HV=0:FOR P=0 TO 3:FOR R=0 TO 3:FOR C=0 TO 3
3020 IF MKP,P,C)=1 THEN 3060
3030 IF MKP,P,C)=0V THEN 3060
3040 IF MKP,P,C)=0V THEN HV=MKP,P,C):P=P:R=R:C=C:GOTO 3060
3050 IF HV=0:0,5 THEN HV=MKP,P,C):P=P:R=R:C=C:GOTO 3060
3060 NEXT C:NEXT R:NEXT P:P=P:R=R:C=C:GOTO 3060
3100 REM*****ADDD PRIORITY VALUES TO TOTAL*****
3150 REM*****ADDD PRIORITY VALUES TO TOTAL*****
4000 FOR T=0 TO 3:P=P:R=R:C=C
4020 ON D GOTO 4050,4060,4070
4030 P=P+1
4040 D=0:3000:4060,4070,4100,4110,4120,4130,4140,4150,4160,4170
4050 P=P+1:GOTO 4180
4060 P=P+1:GOTO 4180
4070 C=C+1:GOTO 4180
4100 P=P:R=R:C=C+1:GOTO 4180
4110 R=R+3-T:GOTO 4180
4120 C=C+3-T:GOTO 4180
4130 P=P:R=R:C=C+3-T:GOTO 4180
4140 R=R+T:C=C+3-T:GOTO 4180
4150 R=R+T:C=C+3-T:GOTO 4180
4160 R=R+3-T:C=C+3-T:GOTO4180
4170 R=R+T:C=C+1
4180 IF P=1 THENMKP,P,R,C)=MKP,P,R,C)+5:GOTO 4200
4190 D=MKP,P,R,C)
4200 NEXT T:IF F=0 THEN F=1:GOSUB 5000:GOTO 4000
4210 F=0:RETURN
4300 REM*****FIND NEW PRIORITY VALUE TO BE STORED AND ADDED,***
5000 IF S=16 THEN GOSUB 2000:PRINT" I WIN !!!":END
5020 IF S=0 THEN PRINT" YOU WIN " :PRINT:END
5030 IF S=6 AND MKP,P,C)=2 THEN S=10:GOTO 5070
5040 IF S=6 AND MKP,P,C)=2 THEN S=8:GOTO 5070
5050 FOR W=0 TO 5:IF D=WH THEN S=D+H:GOTO 5070
5060 NEXT H
5070 D=1:RETURN
```

## Message scroller

on ZX81

The program asks you to type in a message. It then scrolls your message four letters at a time up the screen, enlarging each character 64 times; forming an 8 x 8 matrix. A machine code routine is used to help speed the printing up.

### Program notes

The program is divided into two sections; the first to enter the machine code (Lines 1-30), when this section of the program has been entered (take care to get line 2 exact) apparent rubbish will appear in line 1 — this is the machine code, lines

to next page

# Open Forum

from previous page

2,5,10,20,25,30 can then be deleted. Lines 40-195 can then be entered — this is the main program. In the program, the two characters used for printing are a space and inverse space. You can change the characters by 'POKE'ing 16529 and 16536 with two new characters.

For example:

```
POKE 16529,128
POKE 16536,8
```

will give inverse video character.

You can use the program to give a continuously repeating message by adding

```
200 GOTO 110
```

## Message scroller

by Philip Haywood

```
1 REM 16545678901234567890123
2 REM 16545678901234567890123
3 REM 16545678901234567890123
4 REM 16545678901234567890123
5 REM 16545678901234567890123
6 REM 16545678901234567890123
7 REM 16545678901234567890123
8 REM 16545678901234567890123
9 REM 16545678901234567890123
10 REM 16545678901234567890123
11 REM 16545678901234567890123
12 REM 16545678901234567890123
13 REM 16545678901234567890123
14 REM 16545678901234567890123
15 REM 16545678901234567890123
16 REM 16545678901234567890123
17 REM 16545678901234567890123
18 REM 16545678901234567890123
19 REM 16545678901234567890123
20 REM 16545678901234567890123
21 REM 16545678901234567890123
22 REM 16545678901234567890123
23 REM 16545678901234567890123
24 REM 16545678901234567890123
25 REM 16545678901234567890123
26 REM 16545678901234567890123
27 REM 16545678901234567890123
28 REM 16545678901234567890123
29 REM 16545678901234567890123
30 REM 16545678901234567890123
31 REM 16545678901234567890123
32 REM 16545678901234567890123
33 REM 16545678901234567890123
34 REM 16545678901234567890123
35 REM 16545678901234567890123
36 REM 16545678901234567890123
37 REM 16545678901234567890123
38 REM 16545678901234567890123
39 REM 16545678901234567890123
40 REM 16545678901234567890123
41 REM 16545678901234567890123
42 REM 16545678901234567890123
43 REM 16545678901234567890123
44 REM 16545678901234567890123
45 REM 16545678901234567890123
46 REM 16545678901234567890123
47 REM 16545678901234567890123
48 REM 16545678901234567890123
49 REM 16545678901234567890123
50 REM 16545678901234567890123
51 REM 16545678901234567890123
52 REM 16545678901234567890123
53 REM 16545678901234567890123
54 REM 16545678901234567890123
55 REM 16545678901234567890123
56 REM 16545678901234567890123
57 REM 16545678901234567890123
58 REM 16545678901234567890123
59 REM 16545678901234567890123
60 REM 16545678901234567890123
61 REM 16545678901234567890123
62 REM 16545678901234567890123
63 REM 16545678901234567890123
64 REM 16545678901234567890123
65 REM 16545678901234567890123
66 REM 16545678901234567890123
67 REM 16545678901234567890123
68 REM 16545678901234567890123
69 REM 16545678901234567890123
70 REM 16545678901234567890123
71 REM 16545678901234567890123
72 REM 16545678901234567890123
73 REM 16545678901234567890123
74 REM 16545678901234567890123
75 REM 16545678901234567890123
76 REM 16545678901234567890123
77 REM 16545678901234567890123
78 REM 16545678901234567890123
79 REM 16545678901234567890123
80 REM 16545678901234567890123
81 REM 16545678901234567890123
82 REM 16545678901234567890123
83 REM 16545678901234567890123
84 REM 16545678901234567890123
85 REM 16545678901234567890123
86 REM 16545678901234567890123
87 REM 16545678901234567890123
88 REM 16545678901234567890123
89 REM 16545678901234567890123
90 REM 16545678901234567890123
91 REM 16545678901234567890123
92 REM 16545678901234567890123
93 REM 16545678901234567890123
94 REM 16545678901234567890123
95 REM 16545678901234567890123
96 REM 16545678901234567890123
97 REM 16545678901234567890123
98 REM 16545678901234567890123
99 REM 16545678901234567890123
100 REM 16545678901234567890123
101 REM 16545678901234567890123
102 REM 16545678901234567890123
103 REM 16545678901234567890123
104 REM 16545678901234567890123
105 REM 16545678901234567890123
106 REM 16545678901234567890123
107 REM 16545678901234567890123
108 REM 16545678901234567890123
109 REM 16545678901234567890123
110 REM 16545678901234567890123
111 REM 16545678901234567890123
112 REM 16545678901234567890123
113 REM 16545678901234567890123
114 REM 16545678901234567890123
115 REM 16545678901234567890123
116 REM 16545678901234567890123
117 REM 16545678901234567890123
118 REM 16545678901234567890123
119 REM 16545678901234567890123
120 REM 16545678901234567890123
121 REM 16545678901234567890123
122 REM 16545678901234567890123
123 REM 16545678901234567890123
124 REM 16545678901234567890123
125 REM 16545678901234567890123
126 REM 16545678901234567890123
127 REM 16545678901234567890123
128 REM 16545678901234567890123
129 REM 16545678901234567890123
130 REM 16545678901234567890123
131 REM 16545678901234567890123
132 REM 16545678901234567890123
133 REM 16545678901234567890123
134 REM 16545678901234567890123
135 REM 16545678901234567890123
136 REM 16545678901234567890123
137 REM 16545678901234567890123
138 REM 16545678901234567890123
139 REM 16545678901234567890123
140 REM 16545678901234567890123
141 REM 16545678901234567890123
142 REM 16545678901234567890123
143 REM 16545678901234567890123
144 REM 16545678901234567890123
145 REM 16545678901234567890123
146 REM 16545678901234567890123
147 REM 16545678901234567890123
148 REM 16545678901234567890123
149 REM 16545678901234567890123
150 REM 16545678901234567890123
151 REM 16545678901234567890123
152 REM 16545678901234567890123
153 REM 16545678901234567890123
154 REM 16545678901234567890123
155 REM 16545678901234567890123
156 REM 16545678901234567890123
157 REM 16545678901234567890123
158 REM 16545678901234567890123
159 REM 16545678901234567890123
160 REM 16545678901234567890123
161 REM 16545678901234567890123
162 REM 16545678901234567890123
163 REM 16545678901234567890123
164 REM 16545678901234567890123
165 REM 16545678901234567890123
166 REM 16545678901234567890123
167 REM 16545678901234567890123
168 REM 16545678901234567890123
169 REM 16545678901234567890123
170 REM 16545678901234567890123
171 REM 16545678901234567890123
172 REM 16545678901234567890123
173 REM 16545678901234567890123
174 REM 16545678901234567890123
175 REM 16545678901234567890123
176 REM 16545678901234567890123
177 REM 16545678901234567890123
178 REM 16545678901234567890123
179 REM 16545678901234567890123
180 REM 16545678901234567890123
181 REM 16545678901234567890123
182 REM 16545678901234567890123
183 REM 16545678901234567890123
184 REM 16545678901234567890123
185 REM 16545678901234567890123
186 REM 16545678901234567890123
187 REM 16545678901234567890123
188 REM 16545678901234567890123
189 REM 16545678901234567890123
190 REM 16545678901234567890123
191 REM 16545678901234567890123
192 REM 16545678901234567890123
193 REM 16545678901234567890123
194 REM 16545678901234567890123
195 REM 16545678901234567890123
196 REM 16545678901234567890123
197 REM 16545678901234567890123
198 REM 16545678901234567890123
199 REM 16545678901234567890123
200 REM 16545678901234567890123
```

## Graph

by Stephen Read

```
10 REM 16545678901234567890123
20 REM 16545678901234567890123
30 REM 16545678901234567890123
40 REM 16545678901234567890123
50 REM 16545678901234567890123
60 REM 16545678901234567890123
70 REM 16545678901234567890123
80 REM 16545678901234567890123
90 REM 16545678901234567890123
100 REM 16545678901234567890123
110 REM 16545678901234567890123
120 REM 16545678901234567890123
130 REM 16545678901234567890123
140 REM 16545678901234567890123
150 REM 16545678901234567890123
160 REM 16545678901234567890123
170 REM 16545678901234567890123
180 REM 16545678901234567890123
190 REM 16545678901234567890123
200 REM 16545678901234567890123
210 REM 16545678901234567890123
220 REM 16545678901234567890123
230 REM 16545678901234567890123
240 REM 16545678901234567890123
250 REM 16545678901234567890123
260 REM 16545678901234567890123
270 REM 16545678901234567890123
280 REM 16545678901234567890123
290 REM 16545678901234567890123
300 REM 16545678901234567890123
310 REM 16545678901234567890123
320 REM 16545678901234567890123
330 REM 16545678901234567890123
340 REM 16545678901234567890123
350 REM 16545678901234567890123
360 REM 16545678901234567890123
370 REM 16545678901234567890123
380 REM 16545678901234567890123
390 REM 16545678901234567890123
400 REM 16545678901234567890123
410 REM 16545678901234567890123
420 REM 16545678901234567890123
430 REM 16545678901234567890123
440 REM 16545678901234567890123
450 REM 16545678901234567890123
460 REM 16545678901234567890123
470 REM 16545678901234567890123
480 REM 16545678901234567890123
490 REM 16545678901234567890123
500 REM 16545678901234567890123
510 REM 16545678901234567890123
520 REM 16545678901234567890123
530 REM 16545678901234567890123
540 REM 16545678901234567890123
550 REM 16545678901234567890123
560 REM 16545678901234567890123
570 REM 16545678901234567890123
580 REM 16545678901234567890123
590 REM 16545678901234567890123
600 REM 16545678901234567890123
610 REM 16545678901234567890123
620 REM 16545678901234567890123
630 REM 16545678901234567890123
640 REM 16545678901234567890123
650 REM 16545678901234567890123
660 REM 16545678901234567890123
670 REM 16545678901234567890123
680 REM 16545678901234567890123
690 REM 16545678901234567890123
700 REM 16545678901234567890123
710 REM 16545678901234567890123
720 REM 16545678901234567890123
730 REM 16545678901234567890123
740 REM 16545678901234567890123
750 REM 16545678901234567890123
760 REM 16545678901234567890123
770 REM 16545678901234567890123
780 REM 16545678901234567890123
790 REM 16545678901234567890123
800 REM 16545678901234567890123
810 REM 16545678901234567890123
820 REM 16545678901234567890123
830 REM 16545678901234567890123
840 REM 16545678901234567890123
850 REM 16545678901234567890123
860 REM 16545678901234567890123
870 REM 16545678901234567890123
880 REM 16545678901234567890123
890 REM 16545678901234567890123
900 REM 16545678901234567890123
910 REM 16545678901234567890123
920 REM 16545678901234567890123
930 REM 16545678901234567890123
940 REM 16545678901234567890123
950 REM 16545678901234567890123
960 REM 16545678901234567890123
970 REM 16545678901234567890123
980 REM 16545678901234567890123
990 REM 16545678901234567890123
1000 REM 16545678901234567890123
```

## Graph

on ZX81

This program draws and labels — as per example — including unplot (rub-out) options. Instructions are at the beginning so as not to interfere with plotting. Just copy the result from screen to printer for presentation.

For those whose ZX81 works for them!

## Train race

by Eric Deeson

( engine blocks

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

( engine

## Train race

on BBC Micro

No way is this a novel game — two engines race across the screen, moving forward a random step each move until one or other reaches the end. The principle is the basis of a number of similar exercises, non-interactive or interactive.

It is straightforward to add twiddly bits like reverse as well as forward motion, barriers and switching tracks (one reason I chose MODE 6, which gives you the "railway lines" for free).

Observe the BBC features of:

- user-definable graphics (lines 10-70);
- calling procedures with different parameters (compare 150, 170, 240);
- sound for the "whistles" (line 250).



# Open Forum

## Space warrior

on Vic-20

The idea is simple but requires some skill to manoeuvre the cross until it is over the centre of an 'alien', when the player must fire and destroy it. The cross can be manoeuvred in both vertical and horizontal directions with a 'repeat' action so to avoid having to keep on pressing the same key to move it a few spaces. The keys I have chosen are:

Z — left  
C — right  
V — down  
G — up  
M — fire

They may seem a little 'clustered up' but I assure you after only a few games they become no problem.

There are ten aliens which must be destroyed within the time limit. The player enters his time at the beginning of the program (4-10 min; this can be shortened or lengthened by changing one or two of the lines from 66-72).

The aliens are randomly positioned at the top of the screen and then come down the screen at totally random movements. The reaction from pressing a key to the movement of the cross is very good.

When, or if, the alien reaches a red border line then it disappears and another is generated. Also if the cross touches the border then it marks the end of the game.

The sound generators have been put to good use especially when an explosion occurs.

## Car race

on ZX81

The object of this game is to manoeuvre your racing car (shown as a multiplication sign) round the racing circuit in a clockwise direction without crashing into the barriers.

Every time a lap is completed the computer adds to your score and randomly places a number of obstacles on the circuit which you have to avoid.

As well as keeping your score the computer also keeps the highest score.

to next page

Space warrior  
by Gerhard Nath

```
10 PRINT "J"
20 PRINT "SPACE WARRIOR!!"
30 PRINT "
40 PRINT "X000"
50 PRINT "Z-LEFT C-RIGHT V-DOWN"
60 PRINT "G-UP & M-FIRE."
65 PRINT "ENTER YOUR TIME(4-10)" INPUT F
66 IFF=4THENS#="000400"
67 IFF=5THENS#="000500"
68 IFF=6THENS#="000600"
69 IFF=7THENS#="000700"
70 IFF=8THENS#="000800"
71 IFF=9THENS#="000900"
72 IFF=10THENS#="001000"
75 PRINT "PRESS A KEY TO START"
90 GETA: IFA#="" THEN 80
98 TI#="000000"
100 POKE36879,14: PRINT "J"
101 L=0
110 FOR I=1 TO 300
120 O=INT(470*RND(1))+7680
130 POKE0,46: NEXT I
140 FOR I=0 TO 20: POKE7680+I,150: POKE38400+I,2: NEXT I
150 FOR I=0 TO 463: STEP 22
160 POKE7702+I,150: POKE38422+I,2: NEXT I
170 FOR I=0 TO 20: POKE8154+I,150: POKE38884+I,2: NEXT I
180 FOR I=0 TO 485: STEP 22
190 POKE8163+I,150: POKE38883+I,2: NEXT I
300 REM ALIENS
305 GOSUB2000
410 J=0: O=INT(18*RND(1))+7703
411 POKE36876,0: FORT=1 TO 1000: NEXT T
420 POKE0+J,60: POKE0+J+1,216: POKE0+J+2,62
430 POKE36878,3: POKE36876,220: GOSUB2000
435 FORT=1 TO 50: NEXT T: GOSUB2000
440 POKE0+J,32: POKE0+J+1,32: POKE0+J+2,32
450 V=INT(3*RND(1))+1
452 IF V=1 THEN J=J+21
454 IF V=2 THEN J=J+22
456 IF V=3 THEN J=J+23
460 IF PEEK(0+J+1)=160 THEN 410
462 IF PEEK(0+J)=160 THEN 410
464 IF PEEK(0+J+2)=160 THEN 410
467 IFTI#="S" THEN 9000
468 POKE36876,0
470 GO TO 420
1000 IF PEEK(0+J+1)=91 THEN 1150
1020 POKE36878,13: POKE36874,220
1030 FORT=1 TO 50: NEXT T
1040 POKE36874,0
1060 RETURN
1150 REM HIT ALIEN
1151 POKE36876,0: FORT=1 TO 60: NEXT T
1160 POKE36878,15: FORT=135 TO 239: STEP 2
1170 POKE36876,H: NEXT H
1175 FORT=1 TO 700: NEXT T
1180 POKE36876,0: POKE36877,220
1181 FORT=1 TO 80: STEP 1
```

## Open Forum

```

1182 POKE36878,M
1183 FORI=1TO3000:NEXTI
1184 NEXTM
1185 POKE36877,0:L=L+1:IFL=10THEN9000
1190 GOTO3000
2000 REM YOUR SHIP
2020 POKE7910+D,91
2040 S=PEEK(197)
2050 IFS=33THEND=D-D:POKE7911+D,32
2060 IFS=34THEND=D+1:POKE7909+D,32
2065 IFS=36THENGOSUB1000
2070 IFS=19THEND=D-22:POKE7932+D,32
2080 IFS=27THEND=D+22:POKE7888+D,32
2085 IFPEEK(7918+D)=160THEN9000
2090 RETURN
9000 PRINT"J":POKE36879,93
9010 PRINT"XXXXXXXXXX":PRINT" WELL DONE YOU'VE"
9020 PRINT"DESTROYED THE ENEMY!!"
9030 END
9000 REM YOUR DEAD
9005 POKE36876,0
9010 POKE36877,220
9020 POKE36879,42
9030 FORI=15TO0STEP-1
9040 POKE36878,I
9045 FORI=1TO3000:NEXTI
9046 NEXTI
9050 POKE36877,0
9060 PRINT"J"
9070 PRINT"XXXXXXXXXX"
9080 PRINT"% YOU'VE BEEN "
9090 PRINT"% ATOMISED!!"
9100 FORI=1TO3000:NEXTI
9200 END

```

```

0000 PRINT AT 10, 12
0001 LET C=1
0002 LET D=0
0003 LET E=0
0004 LET F=0
0005 LET G=0
0006 LET H=0
0007 LET I=0
0008 LET J=0
0009 LET K=0
0010 LET L=0
0011 LET M=0
0012 LET N=0
0013 LET O=0
0014 LET P=0
0015 LET Q=0
0016 LET R=0
0017 LET S=0
0018 LET T=0
0019 LET U=0
0020 PRINT "COUNTS: C,L,AT"
0021 LET C=C+1
0022 LET L=L+1
0023 LET AT=AT+1
0024 IF V,X,C=0 THEN LET D=D+1
0025 IF D=0 THEN LET E=E+1
0026 IF D=1 THEN LET F=F+1
0027 IF D=2 THEN LET G=G+1
0028 IF D=3 THEN LET H=H+1
0029 IF D=4 THEN LET I=I+1
0030 IF D=5 THEN LET J=J+1
0031 IF D=6 THEN LET K=K+1
0032 IF D=7 THEN LET L=L+1
0033 IF D=8 THEN LET M=M+1
0034 IF D=9 THEN LET N=N+1
0035 IF D=10 THEN LET O=O+1
0036 IF D=11 THEN LET P=P+1
0037 IF D=12 THEN LET Q=Q+1
0038 IF D=13 THEN LET R=R+1
0039 IF D=14 THEN LET S=S+1
0040 IF D=15 THEN LET T=T+1
0041 IF D=16 THEN LET U=U+1
0042 IF D=17 THEN LET V=V+1
0043 IF D=18 THEN LET W=W+1
0044 IF D=19 THEN LET X=X+1
0045 IF D=20 THEN LET Y=Y+1
0046 IF D=21 THEN LET Z=Z+1
0047 IF D=22 THEN LET AA=AA+1
0048 IF D=23 THEN LET AB=AB+1
0049 IF D=24 THEN LET AC=AC+1
0050 IF D=25 THEN LET AD=AD+1
0051 IF D=26 THEN LET AE=AE+1
0052 IF D=27 THEN LET AF=AF+1
0053 IF D=28 THEN LET AG=AG+1
0054 IF D=29 THEN LET AH=AH+1
0055 IF D=30 THEN LET AI=AI+1
0056 IF D=31 THEN LET AJ=AJ+1
0057 IF D=32 THEN LET AK=AK+1
0058 IF D=33 THEN LET AL=AL+1
0059 IF D=34 THEN LET AM=AM+1
0060 IF D=35 THEN LET AN=AN+1
0061 IF D=36 THEN LET AO=AO+1
0062 IF D=37 THEN LET AP=AP+1
0063 IF D=38 THEN LET AQ=AQ+1
0064 IF D=39 THEN LET AR=AR+1
0065 IF D=40 THEN LET AS=AS+1
0066 IF D=41 THEN LET AT=AT+1
0067 IF D=42 THEN LET AU=AU+1
0068 IF D=43 THEN LET AV=AV+1
0069 IF D=44 THEN LET AW=AW+1
0070 IF D=45 THEN LET AX=AX+1
0071 IF D=46 THEN LET AY=AY+1
0072 IF D=47 THEN LET AZ=AZ+1
0073 IF D=48 THEN LET BA=BA+1
0074 IF D=49 THEN LET BB=BB+1
0075 IF D=50 THEN LET BC=BC+1
0076 IF D=51 THEN LET BD=BD+1
0077 IF D=52 THEN LET BE=BE+1
0078 IF D=53 THEN LET BF=BF+1
0079 IF D=54 THEN LET BG=BG+1
0080 IF D=55 THEN LET BH=BH+1
0081 IF D=56 THEN LET BI=BI+1
0082 IF D=57 THEN LET BJ=BJ+1
0083 IF D=58 THEN LET BK=BK+1
0084 IF D=59 THEN LET BL=BL+1
0085 IF D=60 THEN LET BM=BM+1
0086 IF D=61 THEN LET BN=BN+1
0087 IF D=62 THEN LET BO=BO+1
0088 IF D=63 THEN LET BP=BP+1
0089 IF D=64 THEN LET BQ=BQ+1
0090 IF D=65 THEN LET BR=BR+1
0091 IF D=66 THEN LET BS=BS+1
0092 IF D=67 THEN LET BT=BT+1
0093 IF D=68 THEN LET BU=BU+1
0094 IF D=69 THEN LET BV=BV+1
0095 IF D=70 THEN LET BW=BW+1
0096 IF D=71 THEN LET BX=BX+1
0097 IF D=72 THEN LET BY=BY+1
0098 IF D=73 THEN LET BZ=BZ+1
0099 IF D=74 THEN LET CA=CA+1
0100 IF D=75 THEN LET CB=CB+1
0101 IF D=76 THEN LET CC=CC+1
0102 IF D=77 THEN LET CD=CD+1
0103 IF D=78 THEN LET CE=CE+1
0104 IF D=79 THEN LET CF=CF+1
0105 IF D=80 THEN LET CG=CG+1
0106 IF D=81 THEN LET CH=CH+1
0107 IF D=82 THEN LET CI=CI+1
0108 IF D=83 THEN LET CJ=CJ+1
0109 IF D=84 THEN LET CK=CK+1
0110 IF D=85 THEN LET CL=CL+1
0111 IF D=86 THEN LET CM=CM+1
0112 IF D=87 THEN LET CN=CN+1
0113 IF D=88 THEN LET CO=CO+1
0114 IF D=89 THEN LET CP=CP+1
0115 IF D=90 THEN LET CQ=CQ+1
0116 IF D=91 THEN LET CR=CR+1
0117 IF D=92 THEN LET CS=CS+1
0118 IF D=93 THEN LET CT=CT+1
0119 IF D=94 THEN LET CU=CU+1
0120 IF D=95 THEN LET CV=CV+1
0121 IF D=96 THEN LET CW=CW+1
0122 IF D=97 THEN LET CX=CX+1
0123 IF D=98 THEN LET CY=CY+1
0124 IF D=99 THEN LET CZ=CZ+1
0125 IF D=100 THEN LET DA=DA+1
0126 IF D=101 THEN LET DB=DB+1
0127 IF D=102 THEN LET DC=DC+1
0128 IF D=103 THEN LET DD=DD+1
0129 IF D=104 THEN LET DE=DE+1
0130 IF D=105 THEN LET DF=DF+1
0131 IF D=106 THEN LET DG=DG+1
0132 IF D=107 THEN LET DH=DH+1
0133 IF D=108 THEN LET DI=DI+1
0134 IF D=109 THEN LET DJ=DJ+1
0135 IF D=110 THEN LET DK=DK+1
0136 IF D=111 THEN LET DL=DL+1
0137 IF D=112 THEN LET DM=DM+1
0138 IF D=113 THEN LET DN=DN+1
0139 IF D=114 THEN LET DO=DO+1
0140 IF D=115 THEN LET DP=DP+1
0141 IF D=116 THEN LET DQ=DQ+1
0142 IF D=117 THEN LET DR=DR+1
0143 IF D=118 THEN LET DS=DS+1
0144 IF D=119 THEN LET DT=DT+1
0145 IF D=120 THEN LET DU=DU+1
0146 IF D=121 THEN LET DV=DV+1
0147 IF D=122 THEN LET DW=DW+1
0148 IF D=123 THEN LET DX=DX+1
0149 IF D=124 THEN LET DY=DY+1
0150 IF D=125 THEN LET DZ=DZ+1
0151 IF D=126 THEN LET EA=EA+1
0152 IF D=127 THEN LET EB=EB+1
0153 IF D=128 THEN LET EC=EC+1
0154 IF D=129 THEN LET ED=ED+1
0155 IF D=130 THEN LET EE=EE+1
0156 IF D=131 THEN LET EF=EF+1
0157 IF D=132 THEN LET EG=EG+1
0158 IF D=133 THEN LET EH=EH+1
0159 IF D=134 THEN LET EI=EI+1
0160 IF D=135 THEN LET EJ=EJ+1
0161 IF D=136 THEN LET EK=EK+1
0162 IF D=137 THEN LET EL=EL+1
0163 IF D=138 THEN LET EM=EM+1
0164 IF D=139 THEN LET EN=EN+1
0165 IF D=140 THEN LET EO=EO+1
0166 IF D=141 THEN LET EP=EP+1
0167 IF D=142 THEN LET EQ=EQ+1
0168 IF D=143 THEN LET ER=ER+1
0169 IF D=144 THEN LET ES=ES+1
0170 IF D=145 THEN LET ET=ET+1
0171 IF D=146 THEN LET EU=EU+1
0172 IF D=147 THEN LET EV=EV+1
0173 IF D=148 THEN LET EW=EW+1
0174 IF D=149 THEN LET EX=EX+1
0175 IF D=150 THEN LET EY=EY+1
0176 IF D=151 THEN LET EZ=EZ+1
0177 IF D=152 THEN LET FA=FA+1
0178 IF D=153 THEN LET FB=FB+1
0179 IF D=154 THEN LET FC=FC+1
0180 IF D=155 THEN LET FD=FD+1
0181 IF D=156 THEN LET FE=FE+1
0182 IF D=157 THEN LET FF=FF+1
0183 IF D=158 THEN LET FG=FG+1
0184 IF D=159 THEN LET FH=FH+1
0185 IF D=160 THEN LET FI=FI+1
0186 IF D=161 THEN LET FJ=FJ+1
0187 IF D=162 THEN LET FK=FK+1
0188 IF D=163 THEN LET FL=FL+1
0189 IF D=164 THEN LET FM=FM+1
0190 IF D=165 THEN LET FN=FN+1
0191 IF D=166 THEN LET FO=FO+1
0192 IF D=167 THEN LET FP=FP+1
0193 IF D=168 THEN LET FQ=FQ+1
0194 IF D=169 THEN LET FR=FR+1
0195 IF D=170 THEN LET FS=FS+1
0196 IF D=171 THEN LET FT=FT+1
0197 IF D=172 THEN LET FU=FU+1
0198 IF D=173 THEN LET FV=FV+1
0199 IF D=174 THEN LET FW=FW+1
0200 IF D=175 THEN LET FX=FX+1
0201 IF D=176 THEN LET FY=FY+1
0202 IF D=177 THEN LET FZ=FZ+1
0203 IF D=178 THEN LET GA=GA+1
0204 IF D=179 THEN LET GB=GB+1
0205 IF D=180 THEN LET GC=GC+1
0206 IF D=181 THEN LET GD=GD+1
0207 IF D=182 THEN LET GE=GE+1
0208 IF D=183 THEN LET GF=GF+1
0209 IF D=184 THEN LET GG=GG+1
0210 IF D=185 THEN LET GH=GH+1
0211 IF D=186 THEN LET GI=GI+1
0212 IF D=187 THEN LET GJ=GJ+1
0213 IF D=188 THEN LET GK=GK+1
0214 IF D=189 THEN LET GL=GL+1
0215 IF D=190 THEN LET GM=GM+1
0216 IF D=191 THEN LET GN=GN+1
0217 IF D=192 THEN LET GO=GO+1
0218 IF D=193 THEN LET GP=GP+1
0219 IF D=194 THEN LET GQ=GQ+1
0220 IF D=195 THEN LET GR=GR+1
0221 IF D=196 THEN LET GS=GS+1
0222 IF D=197 THEN LET GT=GT+1
0223 IF D=198 THEN LET GU=GU+1
0224 IF D=199 THEN LET GV=GV+1
0225 IF D=200 THEN LET GW=GW+1
0226 IF D=201 THEN LET GX=GX+1
0227 IF D=202 THEN LET GY=GY+1
0228 IF D=203 THEN LET GZ=GZ+1
0229 IF D=204 THEN LET HA=HA+1
0230 IF D=205 THEN LET HB=HB+1
0231 IF D=206 THEN LET HC=HC+1
0232 IF D=207 THEN LET HD=HD+1
0233 IF D=208 THEN LET HE=HE+1
0234 IF D=209 THEN LET HF=HF+1
0235 IF D=210 THEN LET HG=HG+1
0236 IF D=211 THEN LET HH=HH+1
0237 IF D=212 THEN LET HI=HI+1
0238 IF D=213 THEN LET HJ=HJ+1
0239 IF D=214 THEN LET HK=HK+1
0240 IF D=215 THEN LET HL=HL+1
0241 IF D=216 THEN LET HM=HM+1
0242 IF D=217 THEN LET HN=HN+1
0243 IF D=218 THEN LET HO=HO+1
0244 IF D=219 THEN
```

### Vic-Orator

on Vic-20

This program which will run on an unexpanded Vic will utilise the facility of a user-defined character set to display double height characters on the screen, the visual equivalent of a shout, ideal for group or display activities.

To write this program to fit into the limited space I have had to cheat a little and only produce 128 characters in the set so the user must be careful to not print any reverse characters (128 onwards) otherwise strange things may happen!

Vic owners with additional memory can get round this by setting-up a 4K character generator and they will also need to change the top of memory locations that are poke-ed in lines 3, 4, 33, 34.

The character set used in the program is the upper case letters and graphics set. If you require upper and lower case letters the peek address in lines 10 and 11 needs to be changed to peek(34816+c).

The REMs are reasonably self-explanatory.

from previous page

## Program notes

The variables are as follows:

S — Your score

HS — High Score

Y — Y co-ordinate of car

X — X co-ordinate of car

L — Number of points to be added to score

D\$ — String which determines direction of car

Lines 1000 — 1100 randomly place obstacles

Array D contains the set-up of the circuit.

When the program is run the screen will go blank for approximately five seconds while the circuit is being printed.

Listings taken from a ZX printer should be cut into convenient lengths and stuck down on to white paper. Please enclose a self-addressed envelope.

### Car race

by Alasdair Sanderson

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32  
 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62  
 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92  
 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120  
 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150  
 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180  
 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210  
 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240  
 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270  
 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300  
 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330  
 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360  
 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390  
 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420  
 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450  
 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480  
 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510  
 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540  
 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570  
 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600  
 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630  
 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660  
 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690  
 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720  
 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750  
 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780  
 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810  
 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840  
 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870  
 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900  
 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930  
 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960  
 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990  
 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1

# Open Forum

## Corrections

A number of mistakes have crept into the programs published in the first issues of *Popular Computing Weekly*. We will print corrections as quickly as possible.

Here is a list of the corrections we have to date:

### Vol 1 No 1 page 9 Space Amaze

Line 25 should be renumbered line 15.  
Line 569 should read IF D\$="C" AND X=1 THEN LET X=X+1  
Line 2000 should read LET Q(X,Y)=2

### Vol 1 No 2 Page 17 Squash

```
80 PROCset-up
130 PRINT CHR$(RND(5)+128);for "TIME DIV
121/12,"seconds"
170 IF AS="Z" OR AS="M" THEN PROCmove-bal
180 PROCmove-bal
260 SOUND T+15,-15,RND(100)+100,255
340 DEF PROCset-up
380 PRINT TAB(10,T+1);(STRING$(28), CHR$(
255);TAB(30,T+19);CHR$(255)
400 TIME=0
```

### Vol-1 No 2 Page 18 Subchase

```
5 LET TH=5
100 LET B$="TAN (YTX)"
355 GOSUB 1000
400 UNPLOT INT (H/(P64))3.30
```

```
1 REM VIC-ORATOR (C)1982 KEN CLARK RUNS ON 3.5K VIC-20
2 REM**LOWER MEMORY TO PROTECT MEMORY @ 5120 OBARDS***
3 POKE$1,255;POKE$2,19
4 POKE$5,255;POKE$6,19
5 CLR
6 REM***BLANK SCREEN WHILE SETTING UP REGISTERS ETC.***
7 POKE$6$67,120
8 REM***SET UP CHARACTER GENERATOR @ 5120 OBARDS***
9 I=0;C=0
10 POKE$120+I,PEEK(32768+C)
11 POKE$120+I+1,PEEK(32768+C)
12 C=C+1;I=I+2
13 IF C=1024 THEN I=0
14 REM***SET REGISTERS FOR USER DEFINED CHAR GENERATOR***
15 POKE$3669,253
16 POKE$3666,PEEK(3666)OR120
17 REM***JUST SCREEN SIZE AND SELECT 16 X 8 CHARACTERS***
18 POKE$6$67,149
19 REM***PUT YOUR MESSAGE/TEXT FROM HERE.....***
20 PRINT"*****LARGE CHARACTERS ARE"
21 PRINT
22 PRINT"POSSIBLE ON THE VIC-20"
23 PRINT
24 PRINT"WITH A USER DEFINABLE"
25 PRINT
26 PRINT"CHARACTER SET."
27 PRINT:PRINT:PRINT"PRESS ANY KEY"
28 REM*****TO HERE - THEN RESET VIC WHEN FINISHED***
29 GETA$;IF A$="" THEN I=0
30 POKE$3669,240
31 POKE$3666,150
32 POKE$6$67,174
33 POKE$1,255;POKE$2,29
34 POKE$5,255;POKE$6,29
```

Vic-Orator  
by Ken Clarke

### Vol 1 No 3 Page 9 Hell Driver

```
10 GOSUB 1000
60 DIM A(14), B(14), C(14), Q$(5), S$(10),
MS(14)
```

```
200 ML=0:PRINT "30 spaces"
```

### Vol 1 No 3 Page 15 Scrabble Scorer

```
1110 PRINT AT 6, J, 10: Q$(4,J)
1225 REM C=COUNT OF PLAYERS
1430 LET Z=SUM(X-20)
1500 LET S/R,N=Z
1510 LET T(N)=T(N)+Z
1520 IF N<2 OR P>2 THEN PRINT AT
X(1),X(2),T(N):"
1530 IF N=2 AND P=2 THEN PRINT AT
X(1),X(2),T(N):"
1540 NEXT N
1550 LET R=R+1
1560 GOTO 1210
4000 CLR
4010 PRINT Q$(1): Q$(2):
4020 IF P>2 THEN PRINT Q$(3):
4030 IF P>3 THEN PRINT Q$(4)
4040 PRINT AT 1,0:"
4050 FOR J=1 TO R
4060 PRINT TAB 1,S(J,1): TAB(18), S(J,2):
4070 IF P>2 THEN PRINT TAB 16,S(J,3):
4080 IF P>3 THEN PRINT TAB 26,S(J,4)
4090 PRINT
4100 NEXT J
4110 STOP
8000 CLEAR
8010 SAVE "SCRABBLE"
8020 RUN
```

### Vol 1 No 3 Page 21 Programming

```
50 FOR I=CODE("graphic 1") TO CODE ("graphic
A")
60 IF B$(I,3)="" THEN GOTO CODE ("graphic W")
```

### Vol 1 No 4 Page 17 Space Pilot

```
370 LET P1=INT((S3/1000)/2)
730 LET X=10-ORKEYS-3" (the rest of the line
remains the same)
```

### Vol 1 No 4 P 23 Programming

Some of you noticed that the programs were missing from Barry Cornhill's article on chaining ZX81 programs in the 13 May 1982 issue. To put matters right, here they are:

```
5 REM P1: CHAIN P1: DATA
10 DIM C$(10)
20 FOR I=1 TO 10
30 LET C$(I)=I
40 NEXT I
5401 LET K=PEEK 16400+256*PEEK 1
5402 LET K=PEEK 16300+256*PEEK 1
5403 FOR I=0 TO 99
5404 FOR J=1 TO 99
5405 FOR K=1 TO 99
5406 FOR L=1 TO 99
5407 FOR M=1 TO 99
5408 FOR N=1 TO 99
5409 FOR O=1 TO 99
5410 FOR P=1 TO 99
5411 FOR Q=1 TO 99
5412 FOR R=1 TO 99
5413 FOR S=1 TO 99
5414 FOR T=1 TO 99
5415 FOR U=1 TO 99
5416 FOR V=1 TO 99
5417 FOR W=1 TO 99
5418 FOR X=1 TO 99
5419 FOR Y=1 TO 99
5420 FOR Z=1 TO 99
5421 FOR A=1 TO 99
5422 FOR B=1 TO 99
5423 FOR C=1 TO 99
5424 FOR D=1 TO 99
5425 FOR E=1 TO 99
5426 FOR F=1 TO 99
5427 FOR G=1 TO 99
5428 FOR H=1 TO 99
5429 FOR I=1 TO 99
5430 FOR J=1 TO 99
5431 FOR K=1 TO 99
5432 FOR L=1 TO 99
5433 FOR M=1 TO 99
5434 FOR N=1 TO 99
5435 FOR O=1 TO 99
5436 FOR P=1 TO 99
5437 FOR Q=1 TO 99
5438 FOR R=1 TO 99
5439 FOR S=1 TO 99
5440 FOR T=1 TO 99
5441 FOR U=1 TO 99
5442 FOR V=1 TO 99
5443 FOR W=1 TO 99
5444 FOR X=1 TO 99
5445 FOR Y=1 TO 99
5446 FOR Z=1 TO 99
5447 FOR A=1 TO 99
5448 FOR B=1 TO 99
5449 FOR C=1 TO 99
5450 FOR D=1 TO 99
5451 FOR E=1 TO 99
5452 FOR F=1 TO 99
5453 FOR G=1 TO 99
5454 FOR H=1 TO 99
5455 FOR I=1 TO 99
5456 FOR J=1 TO 99
5457 FOR K=1 TO 99
5458 FOR L=1 TO 99
5459 FOR M=1 TO 99
5460 FOR N=1 TO 99
5461 FOR O=1 TO 99
5462 FOR P=1 TO 99
5463 FOR Q=1 TO 99
5464 FOR R=1 TO 99
5465 FOR S=1 TO 99
5466 FOR T=1 TO 99
5467 FOR U=1 TO 99
5468 FOR V=1 TO 99
5469 FOR W=1 TO 99
5470 FOR X=1 TO 99
5471 FOR Y=1 TO 99
5472 FOR Z=1 TO 99
5473 FOR A=1 TO 99
5474 FOR B=1 TO 99
5475 FOR C=1 TO 99
5476 FOR D=1 TO 99
5477 FOR E=1 TO 99
5478 FOR F=1 TO 99
5479 FOR G=1 TO 99
5480 FOR H=1 TO 99
5481 FOR I=1 TO 99
5482 FOR J=1 TO 99
5483 FOR K=1 TO 99
5484 FOR L=1 TO 99
5485 FOR M=1 TO 99
5486 FOR N=1 TO 99
5487 FOR O=1 TO 99
5488 FOR P=1 TO 99
5489 FOR Q=1 TO 99
5490 FOR R=1 TO 99
5491 FOR S=1 TO 99
5492 FOR T=1 TO 99
5493 FOR U=1 TO 99
5494 FOR V=1 TO 99
5495 FOR W=1 TO 99
5496 FOR X=1 TO 99
5497 FOR Y=1 TO 99
5498 FOR Z=1 TO 99
5499 FOR A=1 TO 99
5500 FOR B=1 TO 99
5501 FOR C=1 TO 99
5502 FOR D=1 TO 99
5503 FOR E=1 TO 99
5504 FOR F=1 TO 99
5505 FOR G=1 TO 99
5506 FOR H=1 TO 99
5507 FOR I=1 TO 99
5508 FOR J=1 TO 99
5509 FOR K=1 TO 99
5510 FOR L=1 TO 99
5511 FOR M=1 TO 99
5512 FOR N=1 TO 99
5513 FOR O=1 TO 99
5514 FOR P=1 TO 99
5515 FOR Q=1 TO 99
5516 FOR R=1 TO 99
5517 FOR S=1 TO 99
5518 FOR T=1 TO 99
5519 FOR U=1 TO 99
5520 FOR V=1 TO 99
5521 FOR W=1 TO 99
5522 FOR X=1 TO 99
5523 FOR Y=1 TO 99
5524 FOR Z=1 TO 99
5525 FOR A=1 TO 99
5526 FOR B=1 TO 99
5527 FOR C=1 TO 99
5528 FOR D=1 TO 99
5529 FOR E=1 TO 99
5530 FOR F=1 TO 99
5531 FOR G=1 TO 99
5532 FOR H=1 TO 99
5533 FOR I=1 TO 99
5534 FOR J=1 TO 99
5535 FOR K=1 TO 99
5536 FOR L=1 TO 99
5537 FOR M=1 TO 99
5538 FOR N=1 TO 99
5539 FOR O=1 TO 99
5540 FOR P=1 TO 99
5541 FOR Q=1 TO 99
5542 FOR R=1 TO 99
5543 FOR S=1 TO 99
5544 FOR T=1 TO 99
5545 FOR U=1 TO 99
5546 FOR V=1 TO 99
5547 FOR W=1 TO 99
5548 FOR X=1 TO 99
5549 FOR Y=1 TO 99
5550 FOR Z=1 TO 99
5551 FOR A=1 TO 99
5552 FOR B=1 TO 99
5553 FOR C=1 TO 99
5554 FOR D=1 TO 99
5555 FOR E=1 TO 99
5556 FOR F=1 TO 99
5557 FOR G=1 TO 99
5558 FOR H=1 TO 99
5559 FOR I=1 TO 99
5560 FOR J=1 TO 99
5561 FOR K=1 TO 99
5562 FOR L=1 TO 99
5563 FOR M=1 TO 99
5564 FOR N=1 TO 99
5565 FOR O=1 TO 99
5566 FOR P=1 TO 99
5567 FOR Q=1 TO 99
5568 FOR R=1 TO 99
5569 FOR S=1 TO 99
5570 FOR T=1 TO 99
5571 FOR U=1 TO 99
5572 FOR V=1 TO 99
5573 FOR W=1 TO 99
5574 FOR X=1 TO 99
5575 FOR Y=1 TO 99
5576 FOR Z=1 TO 99
5577 FOR A=1 TO 99
5578 FOR B=1 TO 99
5579 FOR C=1 TO 99
5580 FOR D=1 TO 99
5581 FOR E=1 TO 99
5582 FOR F=1 TO 99
5583 FOR G=1 TO 99
5584 FOR H=1 TO 99
5585 FOR I=1 TO 99
5586 FOR J=1 TO 99
5587 FOR K=1 TO 99
5588 FOR L=1 TO 99
5589 FOR M=1 TO 99
5590 FOR N=1 TO 99
5591 FOR O=1 TO 99
5592 FOR P=1 TO 99
5593 FOR Q=1 TO 99
5594 FOR R=1 TO 99
5595 FOR S=1 TO 99
5596 FOR T=1 TO 99
5597 FOR U=1 TO 99
5598 FOR V=1 TO 99
5599 FOR W=1 TO 99
5600 FOR X=1 TO 99
5601 FOR Y=1 TO 99
5602 FOR Z=1 TO 99
5603 FOR A=1 TO 99
5604 FOR B=1 TO 99
5605 FOR C=1 TO 99
5606 FOR D=1 TO 99
5607 FOR E=1 TO 99
5608 FOR F=1 TO 99
5609 FOR G=1 TO 99
5610 FOR H=1 TO 99
5611 FOR I=1 TO 99
5612 FOR J=1 TO 99
5613 FOR K=1 TO 99
5614 FOR L=1 TO 99
5615 FOR M=1 TO 99
5616 FOR N=1 TO 99
5617 FOR O=1 TO 99
5618 FOR P=1 TO 99
5619 FOR Q=1 TO 99
5620 FOR R=1 TO 99
5621 FOR S=1 TO 99
5622 FOR T=1 TO 99
5623 FOR U=1 TO 99
5624 FOR V=1 TO 99
5625 FOR W=1 TO 99
5626 FOR X=1 TO 99
5627 FOR Y=1 TO 99
5628 FOR Z=1 TO 99
5629 FOR A=1 TO 99
5630 FOR B=1 TO 99
5631 FOR C=1 TO 99
5632 FOR D=1 TO 99
5633 FOR E=1 TO 99
5634 FOR F=1 TO 99
5635 FOR G=1 TO 99
5636 FOR H=1 TO 99
5637 FOR I=1 TO 99
5638 FOR J=1 TO 99
5639 FOR K=1 TO 99
5640 FOR L=1 TO 99
5641 FOR M=1 TO 99
5642 FOR N=1 TO 99
5643 FOR O=1 TO 99
5644 FOR P=1 TO 99
5645 FOR Q=1 TO 99
5646 FOR R=1 TO 99
5647 FOR S=1 TO 99
5648 FOR T=1 TO 99
5649 FOR U=1 TO 99
5650 FOR V=1 TO 99
5651 FOR W=1 TO 99
5652 FOR X=1 TO 99
5653 FOR Y=1 TO 99
5654 FOR Z=1 TO 99
5655 FOR A=1 TO 99
5656 FOR B=1 TO 99
5657 FOR C=1 TO 99
5658 FOR D=1 TO 99
5659 FOR E=1 TO 99
5660 FOR F=1 TO 99
5661 FOR G=1 TO 99
5662 FOR H=1 TO 99
5663 FOR I=1 TO 99
5664 FOR J=1 TO 99
5665 FOR K=1 TO 99
5666 FOR L=1 TO 99
5667 FOR M=1 TO 99
5668 FOR N=1 TO 99
5669 FOR O=1 TO 99
5670 FOR P=1 TO 99
5671 FOR Q=1 TO 99
5672 FOR R=1 TO 99
5673 FOR S=1 TO 99
5674 FOR T=1 TO 99
5675 FOR U=1 TO 99
5676 FOR V=1 TO 99
5677 FOR W=1 TO 99
5678 FOR X=1 TO 99
5679 FOR Y=1 TO 99
5680 FOR Z=1 TO 99
5681 FOR A=1 TO 99
5682 FOR B=1 TO 99
5683 FOR C=1 TO 99
5684 FOR D=1 TO 99
5685 FOR E=1 TO 99
5686 FOR F=1 TO 99
5687 FOR G=1 TO 99
5688 FOR H=1 TO 99
5689 FOR I=1 TO 99
5690 FOR J=1 TO 99
5691 FOR K=1 TO 99
5692 FOR L=1 TO 99
5693 FOR M=1 TO 99
5694 FOR N=1 TO 99
5695 FOR O=1 TO 99
5696 FOR P=1 TO 99
5697 FOR Q=1 TO 99
5698 FOR R=1 TO 99
5699 FOR S=1 TO 99
5700 FOR T=1 TO 99
5701 FOR U=1 TO 99
5702 FOR V=1 TO 99
5703 FOR W=1 TO 99
5704 FOR X=1 TO 99
5705 FOR Y=1 TO 99
5706 FOR Z=1 TO 99
5707 FOR A=1 TO 99
5708 FOR B=1 TO 99
5709 FOR C=1 TO 99
5710 FOR D=1 TO 99
5711 FOR E=1 TO 99
5712 FOR F=1 TO 99
5713 FOR G=1 TO 99
5714 FOR H=1 TO 99
5715 FOR I=1 TO 99
5716 FOR J=1 TO 99
5717 FOR K=1 TO 99
5718 FOR L=1 TO 99
5719 FOR M=1 TO 99
5720 FOR N=1 TO 99
5721 FOR O=1 TO 99
5722 FOR P=1 TO 99
5723 FOR Q=1 TO 99
5724 FOR R=1 TO 99
5725 FOR S=1 TO 99
5726 FOR T=1 TO 99
5727 FOR U=1 TO 99
5728 FOR V=1 TO 99
5729 FOR W=1 TO 99
5730 FOR X=1 TO 99
5731 FOR Y=1 TO 99
5732 FOR Z=1 TO 99
5733 FOR A=1 TO 99
5734 FOR B=1 TO 99
5735 FOR C=1 TO 99
5736 FOR D=1 TO 99
5737 FOR E=1 TO 99
5738 FOR F=1 TO 99
5739 FOR G=1 TO 99
5740 FOR H=1 TO 99
5741 FOR I=1 TO 99
5742 FOR J=1 TO 99
5743 FOR K=1 TO 99
5744 FOR L=1 TO 99
5745 FOR M=1 TO 99
5746 FOR N=1 TO 99
5747 FOR O=1 TO 99
5748 FOR P=1 TO 99
5749 FOR Q=1 TO 99
5750 FOR R=1 TO 99
5751 FOR S=1 TO 99
5752 FOR T=1 TO 99
5753 FOR U=1 TO 99
5754 FOR V=1 TO 99
5755 FOR W=1 TO 99
5756 FOR X=1 TO 99
5757 FOR Y=1 TO 99
5758 FOR Z=1 TO 99
5759 FOR A=1 TO 99
5760 FOR B=1 TO 99
5761 FOR C=1 TO 99
5762 FOR D=1 TO 99
5763 FOR E=1 TO 99
5764 FOR F=1 TO 99
5765 FOR G=1 TO 99
5766 FOR H=1 TO 99
5767 FOR I=1 TO 99
5768 FOR J=1 TO 99
5769 FOR K=1 TO 99
5770 FOR L=1 TO 99
5771 FOR M=1 TO 99
5772 FOR N=1 TO 99
5773 FOR O=1 TO 99
5774 FOR P=1 TO 99
5775 FOR Q=1 TO 99
5776 FOR R=1 TO 99
5777 FOR S=1 TO 99
5778 FOR T=1 TO 99
5779 FOR U=1 TO 99
5780 FOR V=1 TO 99
5781 FOR W=1 TO 99
5782 FOR X=1 TO 99
5783 FOR Y=1 TO 99
5784 FOR Z=1 TO 99
5785 FOR A=1 TO 99
5786 FOR B=1 TO 99
5787 FOR C=1 TO 99
5788 FOR D=1 TO 99
5789 FOR E=1 TO 99
5790 FOR F=1 TO 99
5791 FOR G=1 TO 99
5792 FOR H=1 TO 99
5793 FOR I=1 TO 99
5794 FOR J=1 TO 99
5795 FOR K=1 TO 99
5796 FOR L=1 TO 99
5797 FOR M=1 TO 99
5798 FOR N=1 TO 99
5799 FOR O=1 TO 99
5800 FOR P=1 TO 99
5801 FOR Q=1 TO 99
5802 FOR R=1 TO 99
5803 FOR S=1 TO 99
5804 FOR T=1 TO 99
5805 FOR U=1 TO 99
5806 FOR V=1 TO 99
5807 FOR W=1 TO 99
5808 FOR X=1 TO 99
5809 FOR Y=1 TO 99
5810 FOR Z=1 TO 99
5811 FOR A=1 TO 99
5812 FOR B=1 TO 99
5813 FOR C=1 TO 99
5814 FOR D=1 TO 99
5815 FOR E=1 TO 99
5816 FOR F=1 TO 99
5817 FOR G=1 TO 99
5818 FOR H=1 TO 99
5819 FOR I=1 TO 99
5820 FOR J=1 TO 99
5821 FOR K=1 TO 99
5822 FOR L=1 TO 99
5823 FOR M=1 TO 99
5824 FOR N=1 TO 99
5825 FOR O=1 TO 99
5826 FOR P=1 TO 99
5827 FOR Q=1 TO 99
5828 FOR R=1 TO 99
5829 FOR S=1 TO 99
5830 FOR T=1 TO 99
5831 FOR U=1 TO 99
5832 FOR V=1 TO 99
5833 FOR W=1 TO 99
5834 FOR X=1 TO 99
5835 FOR Y=1 TO 99
5836 FOR Z=1 TO 99
5837 FOR A=1 TO 99
5838 FOR B=1 TO 99
5839 FOR C=1 TO 99
5840 FOR D=1 TO 99
5841 FOR E=1 TO 99
5842 FOR F=1 TO 99
5843 FOR G=1 TO 99
5844 FOR H=1 TO 99
5845 FOR I=1 TO 99
5846 FOR J=1 TO 99
5847 FOR K=1 TO 99
5848 FOR L=1 TO 99
5849 FOR M=1 TO 99
5850 FOR N=1 TO 99
5851 FOR O=1 TO 99
5852 FOR P=1 TO 99
5853 FOR Q=1 TO 99
5854 FOR R=1 TO 99
5855 FOR S=1 TO 99
5856 FOR T=1 TO 99
5857 FOR U=1 TO 99
5858 FOR V=1 TO 99
5859 FOR W=1 TO 99
5860 FOR X=1 TO 99
5861 FOR Y=1 TO 99
5862 FOR Z=1 TO 99
5863 FOR A=1 TO 99
5864 FOR B=1 TO 99
5865 FOR C=1 TO 99
5866 FOR D=1 TO 99
5867 FOR E=1 TO 99
5868 FOR F=1 TO 99
5869 FOR G=1 TO 99
5870 FOR H=1 TO 99
5871 FOR I=1 TO 99
5872 FOR J=1 TO 99
5873 FOR K=1 TO 99
5874 FOR L=1 TO 99
5875 FOR M=1 TO 99
5876 FOR N=1 TO 99
5877 FOR O=1 TO 99
5878 FOR P=1 TO 99
5879 FOR Q=1 TO 99
5880 FOR R=1 TO 99
5881 FOR S=1 TO 99
5882 FOR T=1 TO 99
5883 FOR U=1 TO 99
5884 FOR V=1 TO 99
5885 FOR W=1 TO 99
5886 FOR X=1 TO 99
5887 FOR Y=1 TO 99
5888 FOR Z=1 TO 99
5889 FOR A=1 TO 99
5890 FOR B=1 TO 99
5891 FOR C=1 TO 99
5892 FOR D=1 TO 99
5893 FOR E=1 TO 99
5894 FOR F=1 TO 99
5895 FOR G=1 TO 99
5896 FOR H=1 TO 99
5897 FOR I=1 TO 99
5898 FOR J=1 TO 99
5899 FOR K=1 TO 99
5900 FOR L=1 TO 99
5901 FOR M=1 TO 99
5902 FOR N=1 TO 99
5903 FOR O=1 TO 99
5904 FOR P=1 TO 99
5905 FOR Q=1 TO 99
5906 FOR R=1 TO 99
5907 FOR S=1 TO 99
5908 FOR T=1 TO 99
5909 FOR U=1 TO 99
5910 FOR V=1 TO 99
5911 FOR W=1 TO 99
5912 FOR X=1 TO 99
5913 FOR Y=1 TO 99
5914 FOR Z=1 TO 99
5915 FOR A=1 TO 99
5916 FOR B=1 TO 99
5917 FOR C=1 TO 99
5918 FOR D=1 TO 99
5919 FOR E=1 TO 99
5920 FOR F=1 TO 99
5921 FOR G=1 TO 99
5922 FOR H=1 TO 99
5923 FOR I=1 TO 99
5924 FOR J=1 TO 99
5925 FOR K=1 TO 99
5926 FOR L=1 TO 99
5927 FOR M=1 TO 99
5928 FOR N=1 TO 99
5929 FOR O=1 TO 99
5930 FOR P=1 TO 99
5931 FOR Q=1 TO 99
5932 FOR R=1 TO 99
5933 FOR S=1 TO 99
5934 FOR T=1 TO 99
5935 FOR U=1 TO 99
5936 FOR V=1 TO 99
5937 FOR W=1 TO 99
5938 FOR X=1 TO 99
5939 FOR Y=1 TO 99
5940 FOR Z=1 TO 99
5941 FOR A=1 TO 99
5942 FOR B=1 TO 99
5943 FOR C=1 TO 99
5944 FOR D=1 TO 99
5945 FOR E=1 TO 99
5946 FOR F=1 TO 99
5947 FOR G=1 TO 99
5948 FOR H=1 TO 99
5949 FOR I=1 TO 99
5950 FOR J=1 TO 99
5951 FOR K=1 TO 99
5952 FOR L=1 TO 99
5953 FOR M=1 TO 99
5954 FOR N=1 TO 99
5955 FOR O=1 TO 99
5956 FOR P=1 TO 99
5957 FOR Q=1 TO 99
5958 FOR R=1 TO 99
5959 FOR S=1 TO 99
5960 FOR T=1 TO 99
5961 FOR U=1 TO 99
5962 FOR V=1 TO 99
5963 FOR W=1 TO 99
5964 FOR X=1 TO 99
5965 FOR Y=1 TO 99
5966 FOR Z=1 TO 99
5967 FOR A=1 TO 99
5968 FOR B=1 TO 99
5969 FOR C=1 TO 99
5970 FOR D=1 TO 99
5971 FOR E=1 TO 99
5972 FOR F=1 TO 99
5973 FOR G=1 TO 99
5974 FOR H=1 TO 99
5975 FOR I=1 TO 99
5976 FOR J=1 TO 99
5977 FOR K=1 TO 99
5978 FOR L=1 TO 99
5979 FOR M=1 TO 99
5980 FOR N=1 TO 99
5981 FOR O=1 TO 99
5982 FOR P=1 TO 99
5983 FOR Q=1 TO 99
5984 FOR R=1 TO 99
5985 FOR S=1 TO 99
5986 FOR T=1 TO 99
5987 FOR U=1 TO 99
5988 FOR V=1 TO 99
5989 FOR W=1 TO 99
5990 FOR X=1 TO 99
5991 FOR Y=1 TO 99
5992 FOR Z=1 TO 99
5993 FOR A=1 TO 99
5994 FOR B=1 TO 99
5995 FOR C=1 TO 99
5996 FOR D=1 TO 99
5997 FOR E=1 TO 99
5998 FOR F=1 TO 99
5999 FOR G=1 TO 99
6000 FOR H=1 TO 99
6001 FOR I=1 TO 99
6002 FOR J=1 TO 99
6003 FOR K=1 TO 99
6004 FOR L=1 TO 99
6005 FOR M=1 TO 99
6006 FOR N=1 TO 99
6007 FOR O=1 TO 99
6008 FOR P=1 TO 99
6009 FOR Q=1 TO 99
6010 FOR R=1 TO 99
6011 FOR S=1 TO 99
6012 FOR T=1 TO 99
6013 FOR U=1 TO 99
6014 FOR V=1 TO 99
6015 FOR W=1 TO 99
6016 FOR X=1 TO 99
6017 FOR Y=1 TO 99
6018 FOR Z=1 TO 99
6019 FOR A=1 TO 99
6020 FOR B=1 TO 99
6021 FOR C=1 TO 99
6022 FOR D=1 TO 99
6023 FOR E=1 TO 99
6024 FOR F=1 TO 99
6025 FOR G=1 TO 99
6026 FOR H=1 TO 99
6027 FOR I=1 TO 99
6028 FOR J=1 TO 99
6029 FOR K=1 TO 99
6030 FOR L=1 TO 99
6031 FOR M=1 TO 99
6032 FOR N=1 TO 99
6033 FOR O=1 TO 99
6034 FOR P=1 TO 99
6035 FOR Q=1 TO 99
6036 FOR R=1 TO 99
6037 FOR S=1 TO 99
6038 FOR T=1 TO 99
6039 FOR U=1 TO 99
6040 FOR V=1 TO 99
6041 FOR W=1 TO 99
6042 FOR X=1 TO 99
6043 FOR Y=1 TO 99
6044 FOR Z=1 TO 99
6045 FOR A=1 TO 99
6046 FOR B=1 TO 99
6047 FOR C=1 TO 99
6048 FOR D=1 TO 99
6049 FOR E=1 TO 99
6050 FOR F=1 TO 99
6051 FOR G=1 TO 99
6052 FOR H=1 TO 99
6053 FOR I=1 TO 99
6054 FOR J=1 TO 99
6055 FOR K=1 TO 99
6056 FOR L=1 TO 99
6057 FOR M=1 TO 99
6058 FOR N=1 TO 99
6059 FOR O=1 TO 99
6060 FOR P=1 TO 99
6061 FOR Q=1 TO 99
6062 FOR R=1 TO 99
6063 FOR S=1 TO 99
6064 FOR T=1 TO 99
6065 FOR U=1 TO 99
6066 FOR V=1 TO 99
6067 FOR W=1 TO 99
6068 FOR X=1 TO 99
6069 FOR Y=1 TO 99
6070 FOR Z=1 TO 99
6071 FOR A=1 TO 99
6072 FOR B=1 TO 99
6073 FOR C=1 TO 99
6074 FOR D=1 TO 99
6075 FOR E=1 TO 99
6076 FOR F=1 TO 99
6077 FOR G=1 TO 99
6078 FOR H=1 TO 99
6079 FOR I=1 TO 99
6080 FOR J=1 TO 99
6081 FOR K=1 TO 99
6082 FOR L=1 TO 99
6083 FOR M=1 TO 99
6084 FOR N=1 TO 99
6085 FOR O=1 TO 99
6086 FOR P=1 TO 99
6087 FOR Q=1 TO 99
6088 FOR R=1 TO 99
6089 FOR S=1 TO 99
6090 FOR T=1 TO 99
6091 FOR U=1 TO 99
6092 FOR V=1 TO 99
6093 FOR W=1 TO 99
6094 FOR X=1 TO 99
6095 FOR Y=1 TO 99
6096 FOR Z=1 TO 99
6097 FOR A=1 TO 99
6098 FOR B=1 TO 99
6099 FOR C=1 TO 99
6100 FOR D=1 TO 99
6101 FOR E=1 TO 99
6102 FOR F=1 TO 99
6103 FOR G=1 TO 99
6104 FOR H=1 TO 99
6105 FOR I=1 TO 99
6106 FOR J=1 TO 99
6107 FOR K=1 TO 99
6108 FOR L=1 TO 99
6109 FOR M=1 TO 99
6110 FOR N=1 TO 99
6111 FOR O=1 TO 99
6112 FOR P=1 TO 99
6113 FOR Q=1 TO 99
6114 FOR R=1 TO 99
6115 FOR S=1 TO 99
6116 FOR T=1 TO 99
6117 FOR U=1 TO 99
6118 FOR V=1 TO 99
6119 FOR W=1 TO 99
6120 FOR X=1 TO 99
6121 FOR Y=1 TO 99
6122 FOR Z=1 TO 99
6123 FOR A=1 TO 99
6124 FOR B=1 TO 99
6125 FOR C=1 TO 99
6126 FOR D=1 TO 99
6127 FOR E=1 TO 99
6128 FOR F=1 TO 99
6129 FOR G=1 TO 99
6130 FOR H=1 TO 99
6131 FOR I=1 TO 99
6132 FOR J=1 TO 99
6133 FOR K=1 TO 99
6134 FOR L=1 TO 99
6135 FOR M=1 TO 99
6136 FOR N=1 TO 99
6137 FOR O=1 TO 99
6138 FOR P=1 TO 99
6139 FOR Q=1 TO 99
6140 FOR R=1 TO 99
6141 FOR S=1 TO 99
6142 FOR T=1 TO 99
6143 FOR U=1 TO 99
6144 FOR V=1 TO 99
6145 FOR W=1 TO 99
6146 FOR X=1 TO 99
6147 FOR Y=1 TO 99
6148 FOR Z=1 TO 99
6149 FOR A=1 TO 99
6150 FOR B=1 TO 99
6151 FOR C=1 TO 99
6152 FOR D=1 TO 99
6153 FOR E=1 TO 99
6154 FOR F=1 TO 99
6155 FOR G=1 TO 99
6156 FOR H=1 TO 99
6157 FOR I=1 TO 99
6158 FOR J=1 TO 99
6159 FOR K=1 TO 99
6160 FOR L=1 TO 99
6161 FOR M=1 TO 99
6162 FOR N=1 TO 99
6163 FOR O=1 TO 99
6164 FOR P=1 TO 99
6165 FOR Q=1 TO 99
6166 FOR R=1 TO 99
6167
```

## How long is a piece of string?

*David Lawrence explains the use of character codes on the ZX81*

Lest ZX-81 owners should ever be tempted to forget the importance of the humble byte, here are three practical and elegant ways of handling strings which depend entirely upon the fact that a single string character can take any one of 256 forms.

First, the formatting of strings which have been stored in dimensioned arrays:

If you were to enter lines 20 to 50 of the demonstration program you would quickly discover that though you had intended to store 'FOX' in line 1 of the array AS, what is actually stored there is 'FOX' followed by 17 spaces. This is because the ZX-81 fills a dimensioned string array with spaces until the positions are used for something else. This could be overcome by changing AS(1) in line 50 to AS(1,1 TO 3) but the array may be intended to hold a large number of strings of different lengths to be fitted into a text at various points. What is needed is a simple method enabling the program to know how much of a dimensioned string is useful information and how much is padding.

An effective answer is illustrated by lines 60-80. Line 60, which could be used with any string up to 254 characters, simply tags a single character on to the front of the string — the CODE value of that character being equal to the length of the string plus the extra character. Line 80 now shows how the useful section of the string can be unerringly identified. AS(2,2 TO CODE AS(2,1)) is the original BS without its padding — in the case of 'FOX' the character with a CODE value of 4 is tagged on to the front and the complex term boils down to no more than AS(2,2 to 4).

This technique of adding 'string length indicators' can considerably add to speed and flexibility compared to commonly used methods such as



ZX81... something to byte on

examining the string, character by character, to assess its length.

Our second usage for single character codes is in relation to the storage of data in long strings rather than in multi-dimensional arrays. Suppose, for instance, that we have a large number of names to store and later access. This can be done by setting up an array with sufficient lines to take all the names. The problem is that if the longest name is likely to be 20 characters long then every line will have to be 20 spaces long, even though most of the other names will only need around 10 characters, a massive waste of memory space.

### Using indicators

Alternatively, the names can be stored in one long string, for instance 'Smith, John, Adams, Bill, Brown, Alison, Hence, no space is wasted but there is, equally, no way for the program to know where one name ends and the next begins. We could put a special marker, such as an asterisk, in between the names, but this would entail examining every character in the string whenever individual names had to be identified.

The section of the demonstration program starting at line 100 illustrates how a long string can be made up of individual entries, each with an SLI tacked on to the front. Lines 200 onwards then show how much indicators can be used to retrieve items from

the string. The loop at line 240 simply uses the SLIs to jump from the beginning of one item to the next until the correct item is reached. Line 280 is not more than a slightly more complicated version of line 80, except that instead of starting to print at position 2, we start at C+1, where C is the position of the SLI of the desired entry.

This section can be used with a little adaptation to produce an effective filing system, nor is it limited to single items of information such as names, since within each entry further SLIs can identify sub-divisions such as: name, address, telephone.

Finally, we shall examine how single character codes can aid in the production of well formatted interactive programs. The program section titled 'Typical Input Routine' illustrates some of the functions that have to be performed when requesting information from the program user.

If the program contains many different requests for information, many of these functions can valuably be transferred to a single subroutine such as that from line 400 to line 560. Before this subroutine can be called, however, the string output requesting information will have to be specified (even if the same request has been made elsewhere), together with the position it is to be printed on the screen which, together with the line calling the subroutine, makes four lines for each call.

The effective use of single character codes is illustrated by the section from lines 570 to 780, which works on the assumption that AS is a two dimensional array containing the questions to be printed. Each question has an SLI attached, followed by two bytes which indicate the screen position at which the string is to be printed. Further single characters could be included which would allow all the printing, whether or not an input is required, to be performed by the subroutine.

The codes themselves are simply attached by the use of a subroutine such as that found at line 790 (which would only be required during program development) and every code character replaces a line defining a variable in the program.

Perhaps the humble byte is not so humble after all.

## Demonstration program by David Lawrence

```

10 REM *****
   REMOVE PADDING
   *****
200 O=CHR$(20)
210 LEFT$="FOX"
220 PRINT "THE QUICK BROWN "A$
230 JUMPS OVER THE LAZY DOG."
240 LET BS=CHR$(LEN BS+1)+BS
250 PRINT AS(2)+BS
260 PRINT "THE QUICK BROWN "A$
270 TO CODE AS(2,1)). JUMPS OV
280 THE LAZY DOG."
290 REM
300 *****
   DATA IN STRINGS
   *****
310 CS=""
320 PRINT "ENTRY:"
330 INPUT BS
340 PRINT BS
350 IF BS="" THEN GOTO 200
360 LET BS=CHR$(LEN BS+1)+BS
370 GOTO 120
380 PRINT "NUMBER OF ENTRY? (0
390 TO 1)
400 INPUT N
410 IF N=0 THEN STOP
420 FOR I=1 TO N-1
430 IF C=LEN C THEN STOP
440 LET C=C+CODE CS(I)
450 NEXT I
460 PRINT N;" "CS(I+1 TO C+CODE
470 CS(I)-1)
480 GOTO 200
490 *****
   TYPICAL INPUT ROUTINE
   *****
500 PRINT AT 17,0;"INPUT NUMBER
510 REQUIRED:"
520 INPUT BS
530 PRINT AT 19,0;"IS THAT CORR
540 (Y/N)"
550 INPUT PS
560 PRINT AT 17,0;"
570 PRINT AT 19,0;"
580 IF PS(1)<>"Y" THEN GOTO 510
590 LET N=BS
600 REM *****
   SUBROUTINE FOR PRINTING
   *****
610 LET P1=1
620 LET P2=0
630 LET PS="NAME OF FUNCTION RE
640 QUIRED:"
650 LET OS=""
660 REM *****
   THIS SUBROUTINE
   REQUIRES THE FOLLOWING
   TO BE DECLARED BEFORE
   IT IS CALLED:
   1) STRING TO BE PRINTED=
   PS.
   2) PRINT POSITIONS (P1,
   P2).
670 *****
   A COMPLETE LINE OF
   SPACES=OS
   *****
680 PRINT AT P1,P2/PS;
690 INPUT OS
700 PRINT OS
710 PRINT AT 19,0;">"OS;"<<"
720 PRINT AT 21,0;"IS THAT CORR
730 (Y/N)"
740 INPUT RS
750 PRINT AT 19,0;OS;OS;OS
760 IF RS(1)<>"Y" THEN GOTO 680
770 PRINT AT P1,P2/OS
780 RETURN
790 REM *****
   INPUT OF STRINGS
   *****
800 PRINT "HOW MANY STRINGS"
810 INPUT S
820 DIM A$(S,20)
830 FOR I=1 TO S
840 PRINT "STRING NO."I;" ";
850 INPUT OS
860 PRINT OS
870 PRINT "LINE FOR PRINTING:"
880 INPUT P1
890 PRINT P1
900 PRINT "COLUMN FOR PRINTING:"
910 INPUT P2
920 PRINT P2
930 LET OS=CHR$(LEN OS+3)+CHR$(
940 CHR$(P2)+OS
950 CLS
960 LET A$(I)=OS
970 NEXT I
980 STOP
990 REM *****

```

# Spectrum

In this new slot various contributors explore different aspects of the ZX Spectrum.

## This is why they called it Spectrum

Nick Hampshire discusses the colour commands on the ZX Spectrum

The Spectrum screen is organised as 24 lines of 32 characters, and the character and background colour of each one of these 768 character spaces can be individually programmed to one of the eight possible colours which can be displayed by the Spectrum.

The two colours associated with each character space are the foreground or character colour, this is referred to as the ink colour, and the background colour or paper. In the normal power up mode the INK colour is black and the PAPER colour white.

There are eight different colours, including black and white, which can be displayed, they are as follows:

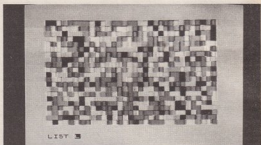
- 0 — black
- 1 — blue
- 2 — red
- 3 — purple or magenta
- 4 — green
- 5 — pale blue or cyan
- 6 — yellow
- 7 — white

These colours are produced on a colour tv by mixing just three primary colours — blue, red and green. Thus magenta, which is colour 3, is produced by mixing colours 1 and 2 — blue and red. Likewise colour 5, cyan, is a mix of colours 1 and 4, and colour 6, yellow is a mix of colours 4 and 2.

From this you can see that the colour number is in fact the sum of the primary colours required to produce that colour. Thus white, which is produced by having all three primary colours mixed, has colour number 7 or colours  $1 + 2 + 4$ .

The number associated with each colour on the above list is important since it is used in the colour commands to designate that colour.

The INK command is used to set the character or foreground colour of characters subsequently displayed



All the fantastic colours: (due to technical reasons, here only in black and white).

using PRINT commands starting at the current cursor position. The command:

```
INK 4 : PRINT "ink colour green"
will print the statement "ink colour green" on the screen starting at the current cursor position in green characters on the existing background colour (normally white) of the screen.
```

To show the range of colours try the following program:

```
10 FOR Q = 0 TO 7
20 INK Q
30 PRINT "ink colour number"; Q
40 NEXT Q
```

The PAPER command is identical to the INK command except that it sets the background colour for the printed characters. Thus the command:

```
PAPER 4 : PRINT "paper colour is green"
will display the statement "paper colour is green" starting at the current cursor position and using the existing ink colour (normally black). The following short program shows the 64 different combinations of INK and PAPER colours which can be obtained.
```

```
10 PRINT "61234567 ink colours"
20 FOR Q = 0 TO 7
30 FOR Z = 0 TO 7
40 INK Z: PAPER Q
50 PRINT "4";
60 NEXT Z
70 PRINT "paper colour"; Q
80 NEXT Q
```

Besides the foreground and background colours there is also the colour of the border around the screen display area. This border can have its colour set by use of the BORDER command followed by one of the eight colour code numbers. Thus:

```
BORDER 5
will set the border to a cyan colour.
```

The original INK or PAPER colours

can be retained for a character by setting the colour value to 8. This means that the characters printed following the command are "transparent", with the previously defined colours on the screen being used to display the new characters. Thus if the command

```
PAPER 8
```

is executed then the PAPER colour will be left as currently displayed on the text following the cursor. However, the INK colour will be that defined in the previous statement. Similarly the command:

```
INK 8
```

will leave the INK colour unchanged but the PAPER colour changed to that defined in the previous colour definition statement. Both INK 8 and PAPER 8 can be used together to leave all colours unchanged.

There is a very poor contrast between some of the colours. For example it is virtually impossible to read a character which has an INK colour of cyan and a PAPER colour of green.

To overcome this and ensure enhanced character contrast there is an extra character code value. To do this you have to use the colour code number 9 after either the INK or PAPER commands.

These set the colour used with either the defined INK or PAPER colour to a colour with the maximum contrast. Thus if the colour is dark (eg. black, blue, red or magenta), then the complimentary colour will be made white. If light, then the complimentary colour will be black.

# Sound & vision



## Beep-Beep, Beep Beep, yeah!

Now that the initial excitement of the ZX Spectrum launch is out of the way, and the computers are starting to be used, its functions are beginning to be explored. My first impression was quite good, even though the machines I saw were pre-production models. There are a number of weaknesses but the machine is a vast improvement on its older brother, especially to readers of this column who will be interested to hear that the Spectrum has sound.

Spectrum sound is governed by the BEEP command, which sounds silly but then so do PEEK and POKE. BEEP is used with two parameters, that is the word Beep is followed by two variables, which may be numbers or variable names, separated by a comma. The first one of these parameters governs the duration of the

sound, the second its pitch. Duration is specified in seconds. I didn't have the opportunity to test the duration for accuracy, but at a guess it should be OK for most music. After all, notes don't usually extend beyond a couple of seconds.

The pitch variable is interesting. If it is given the value 0 then the pitch is that of middle C. Add one to get the next semitone, ie C sharp or D flat. Adding one always gives the next semitone up, subtracting gives the one lower.

The pitches are so organised to make an octave rise equal an extra twelve added to the pitch value. This continues to rise all the way up to a pitch value of around 73, way beyond my hearing, where an illegal parameter error message is given. I'm sure people can think up some good uses for the very high frequencies, such as

disturbing bats and opera singers.

Another nice touch is that these pitches don't have to be integers — in other words quarter tones — and smaller pitch variations can be programmed. This gives rise to two more possibilities.

The first is the playing of Arabic, or Chinese music where the scales are organised differently.

The second is tuning of the Spectrum to other musical instruments. This can be done by ear, adding tiny fractions as an increment until two pitches coincide.

It also raises the possibility of portamento between two notes.

It is quite likely that BEEP is not accurate over more than a couple of octaves, so this limitation should be kept in mind. Also I expect BEEP will be affected greatly by dirty power supplies.

Sam Blythe



The BEEP key on the Spectrum is next to CAPS SHIFT.



## The colourful plot thickens

The graphical complexity of the BBC Micro is such as to make it one of the most useful machines around, yet the very wide range of options, permutations and cunning tricks can get rather confusing.

This week, we'll look at one of the most important graphics capabilities and how it can be used.

The feature is called XOR plotting — XOR standing for 'exclusive or'. You probably recognise this as a term from logic, to be grouped with others like AND, OR and NOT. Whilst the latter are fairly easily understood, XOR is more difficult to grasp.

What is easy to appreciate, however, is the fact that it applies to plotting a colour on the screen, and means that the colour you draw with is modified by the colour already there, 'underneath it'.

XOR plotting, simply, means that the computer does a quick check on the information already present in the bit of memory looking after each pixel — individual dot — on the screen.

Normal plotting would just replace whatever information was there with new stuff — hence replacing the old colour with the new. Red might be changed to black, or white made yellow, for example.

But XOR plotting implies that if, say, red

is laid over yellow, the result is a new colour altogether. Or — what is even more useful — if a colour is plotted on the screen in XOR mode, then plotted again, it disappears. What is more, it vanishes leaving whatever was underneath still intact!

Only a few other machines, such as the RML 38Z, can do this. They let you move shapes (or text) around over an already existing coloured background, leaving the original image just as it was before.

Here's how to use it. Having set up a graphics mode (try MODE 5), you can determine the colour of any plotting commands by the use of GCOL. GCOL needs two numbers following it, separated from each other by a comma. In normal use, the first digit is 0, and the second is 0 to 3, which gives colours black, red, yellow and white (or their monochrome equivalents on a black-and-white tv).

So GCOL 0,3 means 'use colour 3, normally'. But change the 0 to a 3, and you're in XOR mode. GCOL3,3 means 'use colour 3, in XOR mode'.

Next week, I'll be presenting two programs — rather brain-damaging ones — using this and other graphics effects. This week, try the program on the left.

Brian Reffin Smith

```
10 MODE 5
20 CLG : clear graphics area
30 FOR I=1 TO 1000
40 GCOL 3,1 : REM plot in XOR red
50 GOSUB 100
60 GCOL 3,2 : REM XOR yellow
70 GOSUB 100
80 NEXT I
90 END
100 REM plot twice
110 X1=(1239) : Y1=(RND(123))
120 X2=(RND(1239)) : Y2=(RND(123))
130 FOR J=1 TO 2
140 MOVE X1,Y1 : DRAW X2,Y2
150 NEXT J
160 RETURN
```

# Our classifieds are faster.

Do you want to sell your computer and buy a bigger and better one?

Have you ever thought of trying to make some money out of selling tapes of your own programs?

Whatever it is you want to buy or sell why not use our classified pages?

It has to be better than waiting for up to nine weeks to get into one of the old monthly magazines.

Not only that, but our rates are very reasonable.

For private individuals it only costs 20p per word, with a minimum of 10 words.

We can make it so cheap because we charge companies using the classified columns 40p per word.

The classified pages can be used for semi-display advertising.

The cost for this is £10 per single column centimetre, with a minimum charge of £30.

All copy for the classified pages must be pre-paid. (You'll find a handy form on page 22).

Cheques and postal orders should be made out to *Popular Computing Weekly*. Your advertisement should arrive at least two weeks before the publication date.

If you have any queries regarding Classified or semi-display advertising please call Alastair Macintosh on 01-930 3840

**Popular Computing Weekly.**  
The fast one.



# Peek & poke

Peek your problems to our address. Ian Beardmore will poke back an answer.

## A QUESTION OF INTERPRETATION

David Geach of Graeme Road, Ross-on-Wye writes:

**Q** I am fairly new to computing, using a second-hand Atom at the moment. Slowly I am learning the jargon but two things are just confusing me. These are Compiler and Interpreter. I do get seem to understand several descriptions that I have read. If anything it makes things seem more complex. Could you please explain them?

**A** A compiler de-codes a program in a high level language, such as Basic or Cobol, into machine code or an assembly language. Initially this is comparatively slow, nevertheless once it has been done the program will RUN faster than an interpreter program. This is because the de-coded program will be stored in the memory.

An Interpreter does essentially the same, except that each statement is done individually and not stored. So each statement has to be re-read and re-coded each time it is used. The advantage of the Interpreter is that it uses less memory, as no interim program has to be stored. The disadvantage is that it takes more time. Obviously the continual re-reading needed for the Interpreter, takes more time to RUN, than the stored de-coded program of the compiler.

## IT'S ALL PART OF THE EDUCATION

K. Daniels of Poole, Dorset writes:

**Q** At the recent computer fair in Earls Court, I heard the name MUSE on two different occasions. No one I have asked seems to have heard of them beyond someone who said that they had heard of them and EZUG but did not know what they were. I haven't a clue. Have you?

**A** Yes. MUSE stands for Micro Users in Secondary Education while EZUG

stands for Educational ZX Users' Group. As you can guess they are both concerned with computers in the school. EZUG was formed out of MUSE, and I gather that both groups are quite active within education, having their own news letters and software libraries.

## THIS SHOULD RAM IT ALL HOME

Nick Starking of Caister-on-Sea, Norfolk writes:

**Q** I am writing to you in the hope that you can answer a question (well two really) for me. I am interested in the Commodore Vic-20, but I feel that the 3.5K RAM is too small. I hear that extra RAM is available, but my query is this: Do the 3K, 8K, and 16K RAM cartridges for the Vic-20 fit inside the computer, or is an expansion unit (like the Afron Expansion Unit) necessary?

Also, I have read about the introduction either later this year, or early next year of the Vic-2016, a 40-column 16K RAM computer which is a big brother to the Vic-20, and the Commodore 64/40, a 40-column, 64K RAM computer which will sell for about £395. Is there an approximate price available for the Vic-2016?

**A** The extra RAM cartridges for the Vic-20 are external, however, a memory expansion port is already supplied, so an expansion unit is not needed unless you want to add other peripherals as well. As for the new Vics, if you look at your third issue of Popular Computing Weekly you will find your question answered on page 5. The Vic-2016, is in fact the Vic-30. Cost will be about £250, and it is due to be launched in January next year.

## PUT MORE POKE IN YOUR RACER

J. R. Johnson of Tottenham, London writes:

**Q** I have had a BBC model B micro since early this month and now I'm writing a

Grand Prix game. I have tried tabbing the curs on to the screen, but this slows the game down. I would prefer to PEEK and POKE to and from a screen location. Could you tell me and many other BBC owners how to use PEEK and POKE to and from a screen location?

**A** The first thing that has to be done is that the SCROLL function has to be stopped, or at least controlled by setting up a text window. This still scrolls the screen, but the VDU RAM locations do not change. Enter this:

VDU 26.0,24.0,30.0

This sets up a screen window for the entire screen. To POKE use the following:

%HMAN x+y=0) ASC character you want

Here x and y are the co-ordinates that you want. To PEEK use the following:

CH=(HMAN-x+y=0)

This makes CH equal to whatever is at x,y. When you want to bring the character on to the screen just enter the line:

CH=CHR "CH"

## STRICTLY FOR THE KNOB TWIDDLER

B. W. Bailey of Hampstead, London NW3 writes:

**Q** As a display for my ZX81 I am using a Toshiba model 10TB battery/mains portable with a 9in screen. It has an integral loop antenna marked, and a coaxial socket marked, into which I plug my ZX81. My problem is that no amount of tuning or setting of the contrast or brilliance controls gives me a clear background but a pattern of alternating light and dark lines persists over the usable area. Can you help me?

**A** Several things could be the cause of the trouble but no one factor presents itself as the most likely cause of the problem. There are two important things that you do not say in your letter. Have you tried your ZX81 with

another television, or another ZX81 on your portable? Also I would guess that when you say background that you are at least getting a cursor. If the tuning is all right, then two possible causes are the power lead, and the coax aerial lead.

The power supply jack can be very fickle on both the ZX80 and 81, try twiddling this in and out. The smallest increment in the right direction can make a vast difference. In the same way check your video lead. When I first got mine the two wires inside one of the plugs were so badly wired that the slightest pressure would cause them to touch, with all the attendant screen decay.

I would have thought that the internal antenna would be cut out as soon as an external lead was connected, but my hardware knowledge, particularly of televisions, is not all it might be. Try using another television, or computer, this will help reduce the number of possible causes of your troubles. Then try checking all the leads, making sure the power lead does not cross the signal lead, if you are using a RAM Pack, try it without the Pack as they usually add to problems like this.

If you still do not get any luck, then all I can suggest is that you go to your local electrical shop and ask their advice, and possibly if you might try out your computer on one or two other models.

If you still get the same sort of problem, then it would seem that the frequency modulator in the ZX81 is at fault, which will mean a return to Sinclair Research. If it works with other televisions then your Toshiba is the cause, and I could not tell you how to rectify that.

● Stop agonising over that problem. Write to Ian Beardmore, Peek & Poke, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

# Competitions

## Puzzle No 7

One of the side-stalls at our summer fête was attracting some attention. Called Lucky Seven, it was the simplest of games, requiring only nine wooden discs — plain on one side, numbered on the other from 1 to 9.

The nine discs were placed face down on a table and were mixed up. For the payment of a 10p stake you could pick up four of the discs at random, which were then turned over to reveal the digits painted on the reverse. The person in charge would then arrange these four digits to form one four-digit number. If this number was divisible by seven then you lost 10p. If, however, it was impossible for a multiple of seven to be formed then you would win £1.

How would you assess the odds against winning this game? (Of course, such 'tricks' as inverting the six and nine are not allowed.)

### Solution for June 4

In order for a man to divide the pile of coconuts into equal fifths and have one left over for the monkey the formula is:

$$A = 45(B - 1)$$

where B equals the number the pile originally contained and A those remaining after the division. A and B, of course, must be integers. By rearranging this equation we get:

$$B = (5/4)A + 1$$

In order for the second man to be able to divide these remaining nuts equally (and have one left over for the monkey), B - 1 must also be exactly divisible by five. If it is, we can repeat the procedure, and so on.

As the final number of nuts must be a multiple of five we start with this number and increase by

five each time. (To find the answer to part (b) of the question then we must start with a minimum of six to have one left over.)

```
10 LET N = 5
20 LET M = 0
30 LET A = N
40 LET B = 5/4*A + 1
50 IF (B - 1)/5 = INT (B - 1)/5 THEN GOTO 100
60 LET N = N + 5
70 GOTO 20
100 LET M = M + 1
110 IF M = 5 THEN PRINT B
120 IF M = 5 THEN STOP
130 LET A = B
140 GOTO 40
```

Run this and you get (a) 3121 coconuts, (b) 15,621 coconuts.

### Winner of Puzzle No 3

The winner is: David Robinson, Montgomery Hill, Frankby, Wirral, who receives £10.

### Solution to Crossword No 3

Across: 3 CPU, 8 Adder, 9 Shampoo, 10 Chop, 11 Gridiron, 13 Lie low, 14 Duplex, 17 Tropical, 19 Anal, 21 Real Ale, 22 Metro, 23 Up Down: 1 Calculators, 2 Odds odd, 3 Cry, 4 Users, 5 Eardrum, 6 Spar, 7 For next loop, 12 Nominal, 15 Length, 16 Panel, 18 Opal, 20 Amp.

### Winner of Crossword No 3

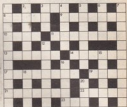
The winner is: D D R Sibbald, St. George's Road, Ilford, Essex, who receives £10.

### Rules

The winner for the crossword and the winner of the puzzle will be the first name out of the hat (in each case).

Closing date for both the crossword and the puzzle is the Monday, three weeks after the cover date.

## Crossword No 7



### ACROSS

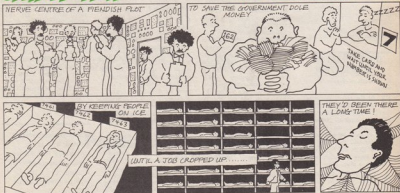
- Program modules that agree with directions (5).
- Program the company to come back and press around (7).
- Program to change source of specified item (4).
- Program to translate PCAT ship, with some help (6).
- Program bit swapping and calling (6).
- Three, to start with, in endlessy nice acid (6).
- Replace a switching device (5).
- Program switch may go through I/O (4).
- Program running order — put to death (7).
- Disable short record in a week (5).
- Slippery when caught on the ice shoes (3).


### DOWN

- Program to translate, table and reprint (11).
- Computing sum of a penny ring (5).
- A quiet tree (3).
- Program storage saves more page inserts (1,1,1,1,1).
- Food container, shales, inputs nothing (4,3).
- Storage unit for church students (4).
- Head underground to avoid the feds (7,4).
- No-speak versions get closer without being observed (5,2).
- Student of an input device (6).
- Say yes to nuclear reactor, electrical engineer (5).
- Credit opposite points of the workers (4).
- Tool amends law (3).

## CITIZEN PAIN

BY DAVID IRELAND and JAMES MACDONALD



 **commodore**

# COMPUTING

Own or use a Pet or a Vic? Fed up with being ignored by all the traditional monthly magazines? Fed up with listings which are too simple or simply do not work?

You need Commodore computing, the new monthly magazine. It is published by Nick Hampshire, author of *The Pet Revealed*, *Pet Graphics*, *A Library Subroutines* and the *Vic Revealed*. Each issue is packed with advanced advice on how to make the most of your computer, whether you use a Pet or a Vic, and whatever your application. Software, hardware, machine code, games, business use — it is all covered in every issue.

If you want to learn more about your computer, take out a subscription to *Commodore Computing*. It is the only way to get it, and get it straight.

**Send £12.50 for a subscription  
for 1 year (10 issues) to:**

**COMMODORE COMPUTING, MAGSUB,  
OAKFIELD HOUSE, PERRYMOUNT ROAD,  
HAYWARDS HEATH, SUSSEX RH16 3DH**

# MORE FUN WITH YOUR ZX81!



## 16K RAM PACK

PUSH-ON PLUG-COMPATIBLE MEMORY

The addition of our fully-compatible, assembled, tested and guaranteed 16K Ram Pack means **more memory for better games and programs**

**ORDER YOURS TODAY FROM:**

**CAPS LTD.** Dept. E, 28 The Spain, Petersfield, Hants GU32 3LA

Please send me my Bye Byte 16K Ram Pack. I enclose cheque/postal order for £34.95 (includes VAT, Postage & Packing)

Name .....

Address .....

Dept. E

Allow 28 days for delivery

Fully **£34.95** inclusive

## WE CHALLENGE YOU, EARTHLING.

Load this COSMOS program in your ZX81 16K and see if you can defend your despicable Earth convoys against our supreme attack ships and warp mines.

A totally new space game concept written in machine code to produce flendishly clever effects and deadly results.

You poor Earthlings have no chance.

**£5.99 ON CASSETTE.**

**PLUS OTHER 16K PROGRAMS ALSO ON CASSETTE**

**TRIAD** Three new puzzles to perplex and frustrate even the Rubik's Cube expert. All with SAVE facility. **£3.99**

**QUANTET** An exciting compendium of crosswords, puzzles and memory tests with up to 10 grades of difficulty. **£3.99**

**TABLE TUTOR** Using concepts within a schoolchild's experience, this menu-driven tutor includes instruction, table lists, speed tests, homework and answer service. **£3.99**

### PET LISTINGS

Black Box, Mastermind, Pontoon.

**£1.60 each or 3 for £4.00**

Only high quality cassettes used

Send cheque or p.o. to:

**VORTEX SOFTWARE (DEPT POP)**  
26 CRAWFORD ROAD,  
HATFIELD, HERTFORDSHIRE, AL10 0PG.



MAIL ORDER ONLY PLEASE. SEND SAE FOR CATALOGUE.

## NEW ZX81 16K SOFTWARE DIGGLES KITCHEN



**SIMPLE SUPPERS  
TO  
CELEBRATION DINNERS  
VOLUME 1**

50 PAGES OF WORLDWIDE RECIPES  
£4.99 (inc. P&P and VAT)

**VOLUME 2**

50 PAGES EUROPEAN RECIPES  
£4.99 (inc. P&P and VAT)

**Special price for two volumes**

**£9 (inc. P&P and VAT)**

More volumes to follow

Please specify

which volume(s) -

Mail order only

Send remittance

to:-

**MICRO COMPUTER SOFTWARE**  
Unit 06, Pear Industrial Estate, Stockport Road, Lower Bredbury,  
Stockport SK6 2BP. Tel: 061-494 2441

